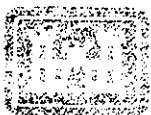


Small Navigation Project
Detailed Project Report
and
Environmental Assessment

Patchogue River Westbrook, Connecticut



US Army Corps
of Engineers
New England Division

DECEMBER 1992

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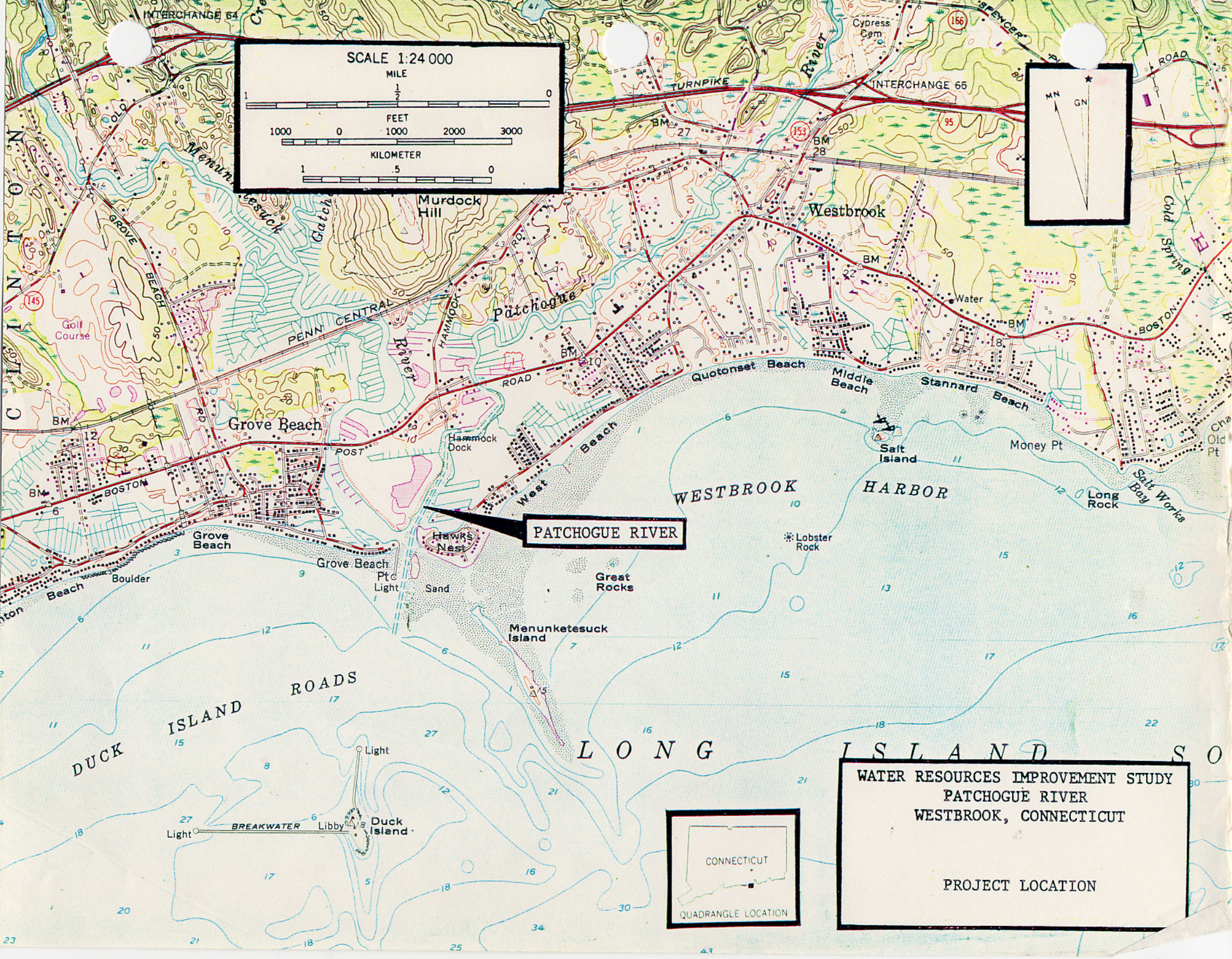
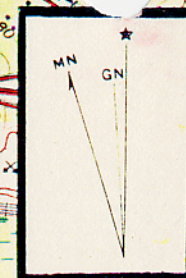
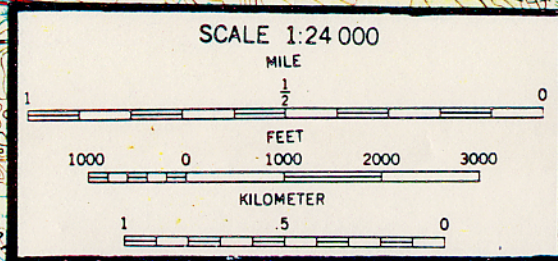
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PATCHOGUE RIVER

WESTBROOK

HARBOR

ROADS

DUCK ISLAND

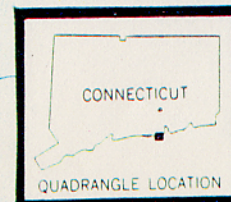
LONG

ISLAND

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WATER RESOURCES IMPROVEMENT STUDY
PATCHOGUE RIVER
WESTBROOK, CONNECTICUT

PROJECT LOCATION



QUADRANGLE LOCATION

PATCHOGUE RIVER
WESTBROOK, CONNECTICUT

DETAILED PROJECT REPORT

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WATER RESOURCES IMPROVEMENT PROJECT
PATCHOGUE RIVER - WESTBROOK, CONNECTICUT

DETAILED PROJECT REPORT

INTRODUCTION

In the last decade, recreational boating has become a highly popular form of relaxation for many individuals. The demand for sailboats, outboards, motorcruisers and even canoes, as well as the facilities to service these craft has been heavy. Existing boating facilities are expanding and plans to construct new facilities along the coastline are continually being formulated. Some navigational improvements constructed many years ago in Long Island Sound by the Federal government struggle to handle volumes of recreational traffic that were never envisioned.

Long Island Sound, being in close proximity to great numbers of people, is a highly popular recreational boating area. Westbrook Harbor is the second largest recreational boating center in Connecticut, accommodating a recreational boating fleet of approximately 1,800 craft. However the main entrance channel in the Patchogue River is not capable of safely and efficiently accommodating the present volume of recreational traffic, as seen in frequent groundings and collisions during the recreational boating season. Local interests have identified certain improvements they feel must be provided to reduce congestion in the harbor and maintain Westbrook's current position as a major recreational port. The feasibility of Federal involvement in providing these improvements is the subject of this detailed project report.

STUDY AUTHORITY

This study was initiated by the New England Division of the U.S. Army Corps of Engineers at the request of the officials of the town of Westbrook. It was prepared under the provisions of Section 107 of the 1960 River and Harbor Act, P.L. 86-645, as amended.

SCOPE OF THE STUDY

The scope of this study includes the preparation of a Detailed Project Report consisting of:

1. Determining the navigational needs of the study area.
2. Identifying navigational opportunities in the study area.
3. Formulating alternative channel improvement plans that meet identified area needs and promote identified opportunities.
4. Evaluating and comparing the economic, social and environmental impacts of the alternative plans.

5. Determining if improvements are feasible and, if so, recommending improvements to the existing navigation channel that are economically feasible, socially beneficial and environmentally acceptable.

Although this study is primarily oriented toward recreational boating, the needs of those commercial fishermen utilizing the Patchogue and Menunketesuck Rivers were also considered.

The geographic scope of this study is generally limited to the Patchogue and Menunketesuck Rivers. In those instances where project impacts extend beyond the study area, these impacts have been evaluated.

STUDY PARTICIPANTS AND COORDINATION

The preparation of this report required close cooperation between the Corps of Engineers, Federal, State and local officials, local commercial fishermen, marina operators, businesses, associations, and interested individuals.

The needs for navigation improvements were outlined in a preliminary report dated June 1977, which led to the Chief of Engineers authorizing the New England Division to proceed with a Detailed Project Report.

PREVIOUS STUDIES AND REPORTS

Federal - Several reports have been prepared by the Corps of Engineers resulting in navigation improvements in the Patchogue River. The existing Federal navigation project, as shown in Figure 2, includes an access channel 8 feet deep, extending from deep water in Long Island Sound to the head of navigation at the U.S. Route 1 highway bridge. The channel is 75 feet wide and approximately 5200 feet long. Also included in the project are an anchorage and maneuvering area 8 feet deep, 75 feet wide and 500 feet long opposite the town wharf and a sand-tight stone jetty extending 600 feet southerly into Duck Island Roads from a point on the west side of the mouth of the river. The existing project was completed in 1956.

A second Federal navigation project is located at Duck Island, approximately 1 mile south of Westbrook. This project as shown on Figure 3 consists of three riprap breakwaters; one north from Duck Island, 1100 feet long; one west from the island 2697 feet long; and one south from Stone Island, 3750 feet long and a 16-foot deep anchorage behind the breakwaters at Duck Island. The existing project was completed in 1917.

Studies of Others - The Connecticut River Estuary Regional Planning Agency conducted a study of marina development for the Connecticut Coastal Area Management Program in 1976. An evaluation of marine facilities in Westbrook, as well as future development potential, was included in this study.

THE REPORT

This Detailed Project Report consists of a Main Report and supporting appendices. The body of the Main Report is structured in accordance with the planning process followed during the course of the study. It is organized as follows: Problem Identification, Formulation of Preliminary Plans, Assessment and Evaluation of Detailed Plans, Comparison of Detailed Plans.

The report has four appendices: Appendix 1 is the Environmental Assessment; Appendix 2, Engineering, describes the engineering data and analyses to support the design and cost estimates; Appendix 3, Economics, contains the economic analyses; and Appendix 4 summarizes public views and responses.

PROBLEM IDENTIFICATION

This portion of the report sets forth the nature and scope of the problems necessitating channel improvements, and establishes planning objectives and constraints that give direction to subsequent planning tasks.

EXISTING CONDITIONS

The town of Westbrook is located on the north shore of Long Island Sound, about 8 miles west of the Connecticut River and 25 miles east of New Haven (See Figure 1). The town extends 4 miles along the shore at Long Island Sound abutted on the west by Clinton and on the east by Old Saybrook. It has an area of 16.2 square miles and is located in Middlesex County.

There are two tidal rivers, the Patchogue and the Menunketesuck, located in Westbrook. Both rivers are relatively short. The Patchogue combines with the Menunketesuck, also called the West Branch, immediately above its mouth and empties into Duck Island Roads, just west of Menunketesuck Island, 1 mile north of Duck Island Harbor. The mean range of the tide is 4.5 feet and the spring tide range is 5.3 feet.

The waters of the Patchogue and Menunketesuck Rivers are presently classified by the State of Connecticut as Class A from their sources to tidewater. The tidewaters of these rivers are classified as SA but presently do not meet the standards for this classification due to some bacterial pollution. The character of Class A water is uniformly excellent; it may be suitable for drinking and/or bathing and all other uses. Class SA waters are suitable for all sea water uses including shellfish harvesting for direct human consumption (approved shellfish areas), bathing, and other water contact sports. Shellfishing has been closed due to recorded coliform counts, primarily in the tidal reaches of the Patchogue River.

The Department of Environmental Protection has monitored water quality in the Menunketesuck River for the past several years during the summer months. Results from the sampling station at the U.S. Route 1 bridge over the river show consistently high dissolved oxygen, near saturation levels, and low turbidity. Although no comparable monitoring has been conducted on the Patchogue River, it is likely that similarly good quality water would be found, except, perhaps, with regard to coliform bacteria. In summary, the Patchogue and Menunketesuck Rivers have moderate water quality problems in the tidal reaches specifically related to high coliform counts.

Population growth in the town of Westbrook has been substantial over the past 50 years. The town's growth rate surpasses those of both Middlesex County and the State of Connecticut. Table 1 details these population changes.

Access to the project area is provided by a well developed system of highways, including the Connecticut Turnpike (I-95) and U.S. Route 1 which parallel the Connecticut coast and Routes 9 and Interstate 91 from Hartford and points north. Conrail provides freight service to the area.

TABLE 1
POPULATION STATISTICS

	<u>Westbrook</u>	<u>Percent Change</u>	<u>Middlesex County</u>	<u>Percent Change</u>	<u>Connecticut</u>	<u>Percent Change</u>
1930	1037	-	51,388	-	1,606,903	-
1940	1159	10.5	55,999	8.9	1,709,242	6.3
1950	1549	33.6	67,332	20.2	2,007,280	17.4
1960	2399	54.8	88,865	31.9	2,535,000	26.2
1970	3820	59.2	115,018	29.4	3,032,217	19.6
1980	5216	36.5	129,017	12.1	3,107,576	2.4

Source: U.S. Census

The main factor for the town's growth is its location on Long Island Sound. The Westbrook Chamber of Commerce takes pride in the town's ability to maintain its New England charm even though it has experienced rapid growth. In spite of the rapid growth of this region the area is still predominantly rural, particularly in inland sections.

Westbrook's population increases significantly in the summer due to the influx of seasonal residents and boaters. However, few summer homes and cottages have been built in the town in recent years due to the high cost and dwindling supply of coastal lots. A trend of converting summer homes to year-round use has been in evidence for a number of years, which in some cases, has led to problems with the overloading or failure of sub-surface sewage disposal systems.

According to 1970 and 1980 census data, 80 percent of the residential structures in Westbrook are single-unit homes. Over the past decade there has been a 38.7 percent growth in the number of single-unit residences, which is consistent with the 36.8 percent overall growth rate in housing for Westbrook. The following table summarizes the available housing information.

TABLE 2
WESTBROOK HOUSING

<u>1970</u>		<u>1980</u>	
1 Unit	1,080	1 Unit	1,662
2-4 Units	110	2-9 Units	228
5 & Up Units	47	10 & Up Units	29
Mobile Homes	145	Mobile Homes	170
Total	<u>1,382</u>	Total	<u>2,089</u>

Source: U.S. Census

Westbrook's three major areas of employment include manufacturing, retail trade and government. These three areas account for 76 percent of all those employed in Westbrook. Employment by industry is depicted in Table 3.

TABLE 3
EMPLOYMENT BY INDUSTRY
WESTBROOK, 1980

<u>Industry</u>	<u>Number</u>	<u>Percent of Total</u>
Manufacturing	280	25
Construction	40	4
Transportation	50	4
Trade		
Wholesale	20	2
Retail	310	28
Finance, Insurance & Real Estate	20	2
Service	140	12
Government	260	23
Total Nonagricultural Employment	1,120	100%

Source: Conn. Labor Dept.

Westbrook's major industry is the boating industry, both recreational and commercial. The town supports the second largest concentration of marinas in Connecticut. There is a strong group of support services for the boating trade including repair shops, gas stations, bait and tackle shops, and restaurants.

The Connecticut State Labor Department reported a labor force of 2,551 people in Westbrook in 1981. Of this total, 2,434 people were employed yielding an unemployment rate of 4.6 percent for the year. Employment in Westbrook is anticipated to increase about 27 percent between 1980 and 2000. This essentially approximates the increase expected for the entire region and is shown in Table 4.

TABLE 4
EMPLOYMENT PROJECTIONS
WESTBROOK, CT
1990, 2000

	<u>1990</u>	<u>% OF 1990 Total</u>	<u>2000</u>	<u>% of 2000 Total</u>
Manufacturing	490	38.6	510	35.9
Nonmanufacturing	780	61.4	910	64.1
Total	1,270	100.0	1,420	100.0

Source: Connecticut River Estuary Regional Planning Agency

The Westbrook Coastal Area, as defined by the Connecticut River Estuary Regional Planning Agency includes 24 percent of the total land area of Westbrook. The primary land use in the Westbrook Coastal Area is residential, utilizing 38 percent of the land area. Over half (52 percent) of this area is categorized as "medium-residential" with lots of 1/2 to 1 acre. Thirty-six percent of the residential area is classified as high density with lots of 1/4 to 1/2 acre. Another 8 percent is considered low-density residential area (over 1 acre lots), while the remaining 4 percent is occupied by mobile homes. The majority of the high density housing is located on the beach front; the medium density housing is dispersed throughout the entire Westbrook Coastal Area. The larger residential lots are located further inland.

Other land uses in the area include Industrial (2 percent), Public and Institutional (5 percent), Commercial (5 percent), Public Open Space, i.e., Parks and beaches (2 percent), Protected Open Space (7 percent), and Marina Trades (2 percent). Of the 990 acres of land classified as vacant, 43 percent is considered suitable for development. The majority of it is zoned for residential purposes. Some land areas are considered to be undevelopable because of tidal or wetland restrictions, high water tables and slopes in excess of 15 percent or more and other limiting factors. A summary of land uses in the coastal area of Westbrook is presented in Table 5.

TABLE 5
GENERALIZED 1980 LAND USE; WESTBROOK COASTAL AREA

<u>LAND USE</u>	<u>ACRES</u>	
Residential		
high 2 acre lots	350	
medium 1/2-1 acre lots	503	
low 1/4-1/2 acre lots	83	
Mobile Homes 1/8-1/4 acre lots	30	
Industrial	50	
Public & Institutional	137	
Commercial (Retail & Services)	129	
Public Open Space (Active: parks and beaches)	37	
Protected Open Space (Passive: Land Trust, Fish and Wild Life)	189	
Marina Trades	<u>65</u>	
Developed Area	1573	
Vacant Area	990	
ESTIMATED TOTAL LAND AREA IN COASTAL AREA	2563	= 24.7% of Town's Land Area.

Studies conducted by the Connecticut River Estuary Regional Planning Agency (CRERPA) indicate that 46 acres of usable nontidal wetlands zoned for commercial boating remain undeveloped in Westbrook. The CRERPA studies further indicated that this is sufficient acreage to accommodate additional marine facilities without encroaching upon tidal wetlands.

Extensive recreational and some commercial use is made of the area encompassing the Patchogue River. In recent years, there have been around 7,300 commercial vessel trips annually.

These vessels are responsible for approximately 111 tons of commerce a year, principally fresh fish and shellfish. Twenty-one fishing vessels are based on the river.

Recreational traffic is heavy and has increased significantly in recent years. Recreational craft drawing up to 5 feet of water recorded 16,275 trips in 1970, while 1973 and 1974 saw boats with drafts up to 6 feet take approximately 21,000 and 25,600 recreational trips, respectively.

There are thirteen marinas in Westbrook, all served by the Federal channel in the Patchogue River. The marinas in turn provide dockage and services for an estimated 1,800 boats. This figure does not include (a) those that are sold each year, and (b) those that are launched at any of three local boat launching ramps. The total annual usage for the Patchogue River channel is probably close to 2,000 or 2,500 boats. Among the equipment provided by the marinas are a marine railway, one 50 ton travel lift, and several small travel lifts.

Large-scale marine development in Westbrook began essentially with construction of the Federal project in the Patchogue River in 1956. The lower Menunketesuck River was not extensively developed for recreational boating until the 1960's. Dredging of a 6 foot channel in the Menunketesuck was done entirely by private interests. Discussions with local marina operators indicate that the demand for boating facilities currently exceeds the supply; some of the marinas have long waiting lists for slips and expect they could fill essentially any new spaces they could develop. This shortage of boating slips has repercussions throughout the local boating economy, as boat sales are more difficult if docking space cannot be guaranteed with the purchase.

The local harbor commission has estimated that the number of boats will eventually level off at around 2,000, which is a reasonable estimate of the potential marina capacity in the Patchogue and Menunketesuck Rivers. On the Patchogue River some boat basin space on the east side of the channel has not been developed, and there is also room for possible expansion of facilities on the west side of the Patchogue River channel as well as in the Menunketesuck River.

Westbrook maintains an active marine patrol that monitors the Patchogue and Menunketesuck Rivers as well as the anchorage area behind the Duck Island breakwaters. The patrol maintains orderly traffic movement in Westbrook Harbor area and assists recreational boaters who run aground when they veer off course when traversing the entrance channel to the harbor.

CONDITIONS IF NO FEDERAL ACTION TAKEN

Without the implementation of improvements in the Patchogue River to facilitate the movement of vessel traffic, little immediate change in the status quo is anticipated. The marina facilities in Westbrook Harbor are now operating at capacity due to the continuing heavy demand for mooring and service facilities in Long Island Sound. As all alternate harbor locations are being fully utilized, and with several of these alternate sites requesting navigation studies to expand existing facilities it is

unlikely that the current full utilization of the region's marine facilities will change in the future.

The nationwide trend toward continued recreational boating expansion is expected to continue. Therefore, it is also expected that there will be a continued demand for recreational boating facilities on Long Island Sound. Should improvements to other Federal navigation systems in the area be undertaken while no action is taken in the Patchogue, it is anticipated that the larger recreational craft in Westbrook will, over time, transfer to rivers and harbors offering less congestion, while their moorings would be taken over by smaller, more maneuverable sailing and power craft.

It is anticipated that private maintenance of the Menunketesuck will continue, whether or not improvements are undertaken in the Patchogue.

PROBLEMS, NEEDS AND OPPORTUNITIES

The problems, needs and opportunities within the study area are directly related to recreational boating activities in the Patchogue and Menunketesuck Rivers. Existing navigation facilities are inadequate to safely and economically accommodate the existing recreational and commercial fleets. Improvements are needed to relieve navigation difficulties and delays and collision damages presently experienced by boaters and fishermen operating from Westbrook. Opportunities exist to improve the area's economy and enhance environmental conditions through providing benefits to the existing fleets.

PROBLEMS

Although the problems may be summarized as congestion in the access channel, several specific areas of difficulty may be identified.

Since the construction of the existing Federal project in 1956 marine facilities on the Patchogue and Menunketesuck Rivers have been continually expanding. The primary problem in this river system is adequate access into Long Island Sound for the existing fleet. The existing access channel into Long Island Sound was not designed to accommodate the number of craft now attempting to utilize it, causing long delays to those entering or leaving Westbrook.

This condition of overcrowding in the entrance channel has led to numerous collisions as boaters attempt to navigate the crowded access channel. Many of these collisions have caused minor damage to watercraft, but no serious injuries to boaters have occurred to date.

Commercial fishermen also suffer delays during the recreational boating season as they must wait their turn to enter or exit the river system. This delay costs them time and fuel.

NEEDS

The needs of the community are developed through the identification of the problems. Additional channel capacity must be provided in the access channel to allow vessels safer maneuvering and to reduce time delays associated with vessel traffic in and out of Westbrook.

In light of the needs cited above, the town of Westbrook has requested the following improvement for the Patchogue River.

Widen the existing Federal channel from deep water in Long Island Sound to the confluence of the Patchogue and Menunketesuck to facilitate movements in and out of Westbrook and to provide increased safety for boaters.

OPPORTUNITIES

Improvements to facilitate navigation in and out of Westbrook would provide for increases in the efficiency of the existing commercial fishing fleet during the recreational boating season and decrease time delays of up to an hour currently experienced by recreational boaters attempting to enter or exit the Patchogue and Menunketesuck Rivers.

With this improvement, Westbrook will remain one of Connecticut's primary recreational boating harbors, capable of accommodating large numbers of recreational boaters, both local and transient. Also, commercial fishermen will not be subject to the time delays they are currently experiencing during the recreational boating season.

The economic benefits resulting from providing improved entrance channel conditions on the Patchogue River would accrue to both the recreational and commercial fleets. Commercial craft could operate with fewer delays during the recreational boating season and pleasure boaters would gain additional recreational time.

The opportunity also exists for contributing to the restoration of adjacent beaches by utilizing appropriate dredged sediments for beach nourishment purposes.

PLANNING CONSTRAINTS

Planning constraints are those items that can place limitations on the plan formulation process and can restrict or minimize adverse impacts. Such impacts may affect a wide range of different concerns including natural conditions within the project site, technological states of the art, economic limits and legal restrictions.

This study has identified, through consultation with local interests, city, State, and Federal agencies and officials a number of concerns relative to the Patchogue and Menunketesuck Rivers and other aspects of

the study area. Of these concerns three specify critical limitations on the planning process and may be categorized as constraints.

The following planning constraints were identified with respect to the proposal to provide Federal navigation improvements to the Patchogue River. These constraints place limits on varying aspects of the planning process and the development of alternative plans of improvement.

The first constraint is to minimize adverse impacts on the fish and wildlife in the study area by restricting construction activities to the fall through early spring to avoid turbidity in the water column during fish runs and the spawning period of soft-shell clams. Also, most waterfowl and shorebirds nest during the spring and summer.

The second constraint is to avoid possible engineering impacts on existing structures. Any channel modifications must be designed to avoid undermining the existing Federal jetty and privately owned seawalls in the project area. An alignment which would place the channel a minimum of 50 feet from any existing structure would be necessary in order to avoid any negative structural impacts. The third and final constraint is to avoid adverse impacts on the marine resources both within the study area and the surrounding waters.

PLANNING CONCERNS

As stated above, consultations with local interests determined a number of concerns which should be identified and addressed.

A major local concern is to minimize the disruption of boating activities during the recreational boating season by scheduling any construction activities to occur during the off-season.

Conducting dredging activities during unfavorable weather conditions can be dangerous and costly. Operation of dredging equipment must not be undertaken during adverse weather conditions.

Placement of any dredged material as beach nourishment should not take place during the summer months so as not to adversely impact on recreational activities and aesthetics at area beaches.

Dredging activities in the outer reach of the Patchogue River will lead to a temporary increase in turbidity. Water quality in the Menunketesuck and Patchogue Rivers will temporarily decline with a flood tide during dredging operations. Disposal at a nearby beach will allow the use of a hydraulic dredge pump instead of a clamshell dredge thereby minimizing the effect of dredging on turbidity levels and water quality.

PROBLEM AND OPPORTUNITY STATEMENTS

These statements are a means of defining a set of goals and study objectives which must be addressed to varying degrees by any considered plan of improvement. The problem and opportunity statements for this study were established after carefully analyzing the identified constraints and concerns regarding the use of water and related land resources in the study area. These statements are developed specifically for the given study area and will be utilized as a guide in the formulation of alternative plans.

Based on the discussion of problems, needs and opportunities, the following statements have been identified as important guidelines to the formulation and evaluation of plans to meet the area's needs and study objectives.

- Contribute to navigational efficiency for recreational purposes in the Patchogue and Menunketesuck Rivers during the 1982 - 2032 period of analysis.

- Contribute to the safety of navigation for commercial and recreational vessels in the Patchogue River during the 1982 - 2032 period of analysis.

- Contribute to the preservation of adjacent beaches during the 1982 - 2032 period of analysis.

Consideration of these statements and planning constraints led to the formulation of detailed alternative plans that will be presented in the following sections.

FORMULATION OF PRELIMINARY PLANS

Systematic consideration of the problems, needs and opportunities led to the formulation of alternative preliminary plans. These plans, designed to achieve the objectives previously identified by the problem and opportunity statements were developed in light of the planning constraints. State and local objectives were also paramount considerations in the evaluation of alternative plans.

MANAGEMENT MEASURES

As the basis for formulating alternative plans, a broad range of management measures can be identified to address the problem and opportunity statements. Management measures can generally be categorized as either structural or nonstructural.

Structural measures would generally involve variations on dredging the Patchogue River to provide additional capacity in the main access channel. Variations considered mainly involve channel width, depth and alignment.

Nonstructural management measures are those that achieve the objectives as stated in the problem and opportunity statements by means other than physical improvements within the study area. Nonstructural management measures would principally involve the transfer of pleasure craft from Westbrook to other rivers and harbors to reduce congestion in the river system.

The need for expanded boating facilities along the Connecticut coastline is evident by the many communities having long waiting lists of pleasure boaters desiring to obtain berths or moorings on or near Long Island Sound. In addition to Westbrook, other principal recreational boating facilities are located at Milford, Old Saybrook, New Haven, Guilford and Clinton Harbors as well as the Branford River (see Figure 4). All of these facilities are currently fully utilized with Clinton, Guilford and Milford having requested navigation studies to expand navigation facilities under the authority of Section 107. Therefore, transferring recreational craft to other rivers and harbors to reduce congestion in the Patchogue River is not a viable alternative as other nearby facilities are presently operating at or above capacity.

Due to the existing full utilization of alternate harbors, and the constraints, concerns, and objectives placed on the project, there are no feasible means of accomplishing the project goals through the implementation of nonstructural solutions. Therefore it was decided to analyze structural solutions to solve the present problems being experienced in the Patchogue River.

Structural solutions would involve the modification of existing navigation facilities that would allow for more efficient utilization of

existing marine facilities in Westbrook. Structural measures would involve widening and/or deepening of the existing Federal navigation channel.

PLAN FORMULATION RATIONALE

The formulation of plans of improvement for the Patchogue River is predicated on a standard set of criteria adopted to permit the development and selection of a plan of improvement which responds to the problems and needs of the area. Each alternative was considered on the basis of its contribution to the planning objectives as stated in the problem and opportunity statements.

Selection of a specific plan for the Patchogue River is based on technical, economic and environmental criteria which would permit a fair and objective appraisal of the consequences and feasibility of alternative solutions.

Technical criteria require that the optimum plan should have facilities and dimensions adequate to accommodate expected user vessels and have sufficient areas both for the maneuvering of boats and the development of shore facilities.

Economic criteria specify that tangible benefits should exceed economic costs and that the scope of the project is such as to provide maximum net benefits.

Environmental criteria involve utilizing available sources of expertise to identify endangered species of marine life. Furthermore, the use of natural resources to affect plan utilization and adverse social impacts should be minimized. Environmental criteria require that activities attracted to the area after plan implementation should be consistent with activities of the surrounding area, and that these activities be environmentally acceptable. The selected plan should incorporate measures to preserve and protect the environmental quality of the project area. Finally, both plan formulation and implementation should be coordinated with interested Federal and non-Federal agencies, local groups, and individuals through cooperative efforts, conferences, public meetings, and other procedures.

PLANS OF OTHERS

According to studies conducted by the Connecticut River Estuary Regional Planning Agency (CRERPA) 46 acres of usable nontidal wetlands zoned for commercial boating remain in Westbrook. Comparing the remaining land zoned for commercial boating to the potential demand for additional marine space in Westbrook, the CRERPA studies stated that from a theoretical supply/demand standpoint there was sufficient acreage to accommodate growth without encroachment into tidal wetlands. From a practical standpoint, the CRERPA report concluded that the configuration of waterfront

parcels, land prices, ownership patterns and most importantly, water access would influence future development.

Westbrook's center of boating activity is along the lower portions of the Patchogue and Menunketesuck Rivers below the U.S. Route 1 bridges which have vertical clearances of 5 feet and 6 feet above MHW, respectively. Between 1965 and 1975, approximately 27 acres of Westbrook's waterfront were developed for marine service uses. It is anticipated that continued demand for marine services will result in additional marine development in Westbrook, especially if channel modifications are undertaken.

Currently, local entrepreneurs are planning to construct new powerboat facilities upstream of the highway bridges. These bridges prohibit upstream movement of sailboats and powercruisers due to low vertical clearances. It is anticipated that this type of development will continue, with smaller boats moving to new or expanded upstream facilities with the larger craft berthing downstream.

ANALYSIS OF PLANS CONSIDERED IN PRELIMINARY PLANNING

During the early stages of this study four alternatives were developed and analyzed. Preliminary planning involved an attempt to identify the most practical channel configurations to be considered in detail.

The various channel configurations investigated include the following:

ALTERNATIVE A - Widen the existing Federal channel from 75 to 100 feet from deep water in Long Island Sound to the confluence of the Patchogue and Menunketesuck Rivers, a distance of approximately 1,800 feet.

ALTERNATIVE B - Widen the existing Federal channel from 75 to 125 feet from deep water in Long Island Sound to the confluence of the Patchogue and Menunketesuck Rivers.

ALTERNATIVE C - Widen the existing Federal channel from 75 to 150 feet from deep water in Long Island Sound to the confluence of the Patchogue and Menunketesuck Rivers.

ALTERNATIVE D - Widen the existing Federal channel from 75 to 100 feet from deep water in Long Island Sound to the highway bridge at U.S. Route 1, a distance of 5,200 feet.

Local interests have indicated that the fleet size is expected to remain approximately constant in the future. Economic and engineering analyses have indicated that existing marine facilities in Westbrook are currently utilized to capacity and fleet expansion can only be increased by developing additional areas for marine use. Since much of this land with marine potential is located upstream of the highway bridges on the Patchogue and Menunketesuck Rivers, use of any of these facilities would be limited to shallow draft motor vessels. Due to the physical dimensions of the Patchogue and Menunketesuck Rivers downstream of the U.S. Route 1 bridges it is anticipated that even with vessel replacement the fleet configuration (length, beam, draft) will remain much as it presently exists. Therefore, the existing authorized depth of 8 feet (MLW) is sufficient to accommodate present and anticipated future traffic.

In summary, all proposed alternatives would allow for increased navigational efficiency of the recreational and commercial fleets using Westbrook as a home port.

COMPARATIVE ASSESSMENT AND EVALUATION OF PRELIMINARY PLANS

An evaluation of the alternatives considered indicated that not all conform to the planning constraints and study objectives as expressed in the problem and opportunity statements.

Alternative A consists of widening the existing Federal channel to 100 feet from deep water in Long Island Sound to the confluence of the Patchogue and Menunketesuck Rivers. This alternative would allow an additional travel lane to be added to the present two-lane channel. The additional lane would expedite the movement of craft in and out of Westbrook during periods of heavy traffic. Construction of this alternative would involve the minimum amount of dredging (approximately 10,000 cubic yards) and would have only minor environmental impacts on the river. As construction would occur only in that portion of the navigation system located in Long Island Sound, the actual river channels would remain unchanged. Material to be dredged would consist of sands mixed with some fine material on the surface of the proposed dredge area. Land and sea disposal options (see Figure 6) exist for dredged materials with local interests having identified Grove Beach as their preferred alternative for material disposal.

Alternative B consists of widening the existing Federal channel to 125 feet from deep water in Long Island Sound to the confluence of the Patchogue and Menunketesuck Rivers. This alternative would allow for an additional two lanes of traffic to be added to the present two-lane channel. Those additional lanes would expedite the movement of recreational and commercial craft in and out of Westbrook during the recreational boating season. Construction of this alternative would involve dredging approximately 17,500 cubic yards of material and would have a minor environmental impact. As construction would occur only in that portion of the navigation system located in Long Island Sound the actual river channels would remain unchanged. There would be temporary impacts to the channel area, but they would have a negligible effect on biota and currents. Disposal options are identical to Alternative A.

Alternative C consists of widening the existing Federal channel to 150 feet from deep water in Long Island Sound to the confluence of the Patchogue and Menunketesuck Rivers. This alternative would allow an additional three lanes of traffic to be added to the present two-lane channel. The additional travel lanes would expedite the movement of recreational and commercial craft in and out of the Patchogue and Menunketesuck Rivers during the recreational boating season. This alternative would involve dredging approximately 25,000 cubic yards of material. The environmental impacts are minor and temporary as in Alternatives A and B. There would be some disturbance of the seabed during dredging operations but this would be of minor consequence. Construction, as in Alternatives A and B, would only occur in that portion of the navigation system located in Long Island Sound. The actual river channels would remain unchanged. There would be temporary impacts to the channel area but they would have a negligible effect on biota and currents. Disposal options are the same as Alternative A.

Alternative D consists of widening the existing Federal channel over its entire length to a width of 100 feet. This alternative would provide some additional efficiency to the navigation system.

This alternative would provide an additional travel lane to be added to the existing navigational system in the Patchogue. Although it would increase the channel width in the Patchogue, it would do little to address the congestion problems at the confluence of the Patchogue and Menunketesuck Rivers, since at peak traffic periods three lanes of Patchogue and two lanes of Menunketesuck traffic would be competing for maneuvering space in the three-lane width of the outer channel. Due to the narrow width of the Patchogue River, this alternative would involve the loss of 40% of the Federal anchorage as channel widening would absorb a segment of the anchorage area. Channel widening would also involve the loss of some private slips and mooring areas, as well as change the cross sectional area of the river below the U.S. Route 1 highway bridge which would alter river currents and affect vertical mixing of the water column. Altering the river currents could have a negative impact on the river biota. In addition the variations in the vertical profiles of temperature and salinity induced by the tides in the Patchogue may also be affected.

CONCLUSIONS

Based on an evaluation of the degree to which each alternative attained the objectives stated in the problem and opportunity statements, Alternatives A, B and C have been selected for further evaluation. Alternative D was eliminated from further consideration due to negative environmental impacts, loss of needed anchorage and slip areas, and failure to significantly reduce overall congestion in the navigation system. The following sections of this report will assess and evaluate in detail the following alternatives, hereafter referred to as Plans A, B and C.

ASSESSMENT AND EVALUATION OF DETAILED PLANS

The preliminary screening of alternatives has resulted in the conclusion that widening the existing Federal channel from deep water in Long Island Sound to the confluence of the Patchogue and Menunketesuck Rivers, a distance of approximately 1,800 feet will best address the navigation problems. Increasing the width of this segment of the navigation system will reduce congestion by reducing travel time between marine facilities in Westbrook and popular Long Island Sound recreational areas. The economic analyses that were used to determine the optional channel width are located in Appendix 3.

The three plans (see Figure 5) described in the following sections are basically variations of channel alternatives. The variations involve differences in channel width. Impacts which are common to plans will be discussed in the following sections. Impacts which are unique to each plan are evaluated in subsequent sections of this report.

GENERAL ASSESSMENT AND EVALUATION OF IMPACTS

All three detailed plans will provide increased efficiency for the recreational and commercial fleets during the recreational boating season by providing additional channel width.

All three plans would have impacts with short and long term implications. Physical activities associated with the construction of improvements would have short term impacts on the aquatic ecosystem. The activities associated with dredging would cause a temporary loss of water quality due to the suspension of some material in the water column. There would also be temporary disruptions of benthic organisms, as well as some localized effects on finfish. These temporary adverse effects may occur during construction; however, conditions would stabilize once the project is completed. Although any benthic organisms present in the affected area during dredging operations would be disrupted, research studies have shown that recolonization would occur within a year.

Oysters and hard clams represent a potentially important resource in the Patchogue and Menunketesuck Rivers, even though the area is currently closed to shellfishing. Soft-shelled clams are also present in the estuary, though in lesser abundance. Both the hard clam and the soft clam are active burrowers and are thus not especially vulnerable to damage from the amounts of turbidity and siltation associated with dredging. The most important shellfishing areas in the town of Westbrook are not in the proposed project area, but rather in Westbrook Harbor and on the east side of Menunketesuck Island where extensive clam bars and oyster beds are found. These areas would not be affected by the proposed dredging project. By using a hydraulic dredge the sediments placed into suspension by the cutterhead would be sucked into the pipeline and transported to the disposal site. Therefore, relatively little actual turbidity would be created by this dredging method unless the discharge was directed back into the water column.

Alternative disposal areas for dredged materials from the Patchogue River may be categorized as beach nourishment, diked land area, open water in Long Island Sound or island nourishment in Long Island Sound. Open water disposal is the most costly alternative. Disposal of material as beach nourishment on Grove Beach would be the most economical solution as well as being among the preferred nourishment options as detailed in the Environmental Assessment. The Connecticut Department of Environmental Protection (DEP) indicated that Westbrook Beach, Grove Beach, and Menunketesuck Island are all potential nourishment sites, with DEP having a particular interest in nourishing Grove Beach for restoration purposes. Nourishing Grove Beach is also a desire of Westbrook residents and officials since it would serve to provide increased protection from wave erosion and surf damage to shorefront properties along the beach as well as restoring a significant portion of this badly eroded beach.

As dredging activities will proceed 7 days a week, 24 hours a day, during construction, noise will become an impact. However, this will only be a short term impact as construction will proceed rapidly. The dredged material will be placed on Grove Beach, adjacent to the project site. The proposed dredging and beach nourishment will not alter the present use of lands adjacent to the project site.

The overall impact of the proposed construction should be minimal since the material to be dredged is predominantly comprised of sand (86-99%) which would be compatible with the existing composition of beach sand on Grove Beach, which is medium-fine brown sands with mean grain size ranging from 0.21 mm to 0.50 mm in diameter.

None of the three plans would significantly impact the Westbrook shoreline. Using the dredged material for beach nourishment purposes would restore sections of Grove Beach that, in some areas, have eroded back to the seawalls protecting beachfront homes.

The proposed project would also have beneficial social and economic impacts. Residents owning property on Grove Point would benefit from increased protection against storm driven wave attack. Economic impacts are discussed in Appendix 3.

There should be little impact to recreational users of Westbrook Harbor caused by the construction activities as they would be scheduled to avoid the summer boating season.

Economic impacts of the proposed alternatives have been evaluated by comparing the estimated costs and benefits. The cost estimates are based upon consideration of many factors including the quantities of dredged material; mobilization and demobilization; equipment costs and wage rates; anticipated dredging rates in cubic yards per hour; and engineering, supervisory, administrative and other factors.

Equivalent annual costs have been calculated for the benefit-cost analysis. These costs have been determined using the 1982 rate of 7-5/8 percent.

Benefits for each alternative have been calculated based on the number of vessels continuing to utilize the area with the implementation of the selected alternative. Calculations of the project's benefits are based on the total number of vessels expected to use the waterway and the value of recreational time gained by each boat by increasing the width of the channel. The present fleet numbers approximately 1,800 vessels. The benefits attributable to the project are based on reduced channel congestion and a reduction of operating costs to the commercial fishing fleet. The method and assumptions used to calculate the benefits to the fleet and detailed benefit-cost calculations are contained in Appendix 3.

MITIGATION REQUIREMENTS

In order to reduce potential impacts of the proposed improvement construction timing is of the utmost importance. Dredging activities in the navigational channel would require approximately one month to complete. Dredging would be scheduled for completion during the fall through early spring in order to minimize conflicts with recreational boaters and avoid any adverse environmental impacts that could result, if the dredging were accomplished during the more productive seasons. Dredging in the fall through spring will avoid the spring-summer spawning runs of smelt, alewife, and blueback herring and spawning and setting period for oysters and clams.

IMPLEMENTATION RESPONSIBILITIES

Cost Allocation

One hundred percent of the project cost is allocated to the construction of the channel and navigation aids. There are no other components to the Federal project.

Cost Apportionment

Local interests must provide a cash contribution toward construction costs, determined in accordance with existing policies for regularly authorized projects, in view of recreational benefits, land enhancement benefits, or similar type special and local benefits excepted to accrue. The present basis for cost-sharing in recreational small-boat projects provides that the Federal Government will participate to not more than 50 percent of the first cost of general navigation facilities serving recreational traffic.

Federal Responsibilities

The Federal project consists only of dredging the access channel. The Federal project does not include any marina facilities, shoreline protection, or site work at any land disposal areas. In addition the

Federal government will maintain this waterway improvement to assure continued navigability pending the availability of funds. All pre-authorization study costs are Federal responsibilities.

Non-Federal Responsibilities

The specific local requirements as contained in the River and Harbor Act are as follows:

(1) Provide a cash contribution toward construction costs, determined in accordance with existing policies for regularly authorized projects, in view of recreational benefits, land enhancement benefits or similar-type special and local benefits expected to accrue.

(2) Provide, maintain and operate without cost to the United States, an adequate public landing with provisions for the sale of motor fuel, lubricants and potable water, open and available to the use of all on equal terms.

(3) Provide without cost to the United States all necessary lands, easements and rights-of-way required for construction and subsequent maintenance of the project including suitable dredged material disposal areas with necessary retaining dikes, bulkheads, and embankments.

(4) Hold and save the United States free from damages that may result from construction, operation and maintenance of the project, except for damages due to the fault or negligence of the United States or its contractors.

(5) Accomplish without cost to the United States alterations and relocations as required in sewer, water supply, drainage and other utility facilities.

(6) Provide and maintain berths, floats, piers, and similar marina and mooring facilities as needed for transient and local vessels as well as necessary access roads, parking areas, and other needed public-use shore facilities, open and available to all on equal terms.

(7) Assume full responsibility for all project costs in excess of the Federal cost limitation of \$2 million dollars.

(8) Establish regulations prohibiting discharge of untreated sewage, garbage, and other pollutants in the waters of the harbor by users thereof. These regulations shall be in accordance with applicable laws or regulations of Federal, State and local authorities responsible for pollution prevention and control.

The following sections of this report assess and evaluate impacts specific to the individual alternative plans.

PLAN EVALUATION

PLAN A

PLAN DESCRIPTION

Plan A (shown on Figure 7) involves widening the existing Federal channel from 75 to 100 feet from deep water in Long Island Sound to the confluence of the Patchogue and Menunketesuck Rivers, a distance of approximately 1,800 feet. The channel would be constructed to the existing depth of 8 feet at mean low water. The channel would be widened on the west side of the existing channel.

IMPACT ASSESSMENT

Dredging Impacts - Plan A includes the dredging of approximately 10,000 cubic yards of medium-fine and silty-sand, permanently altering 0.9 acres of river bottom and altering the depth of 0.01 acres of the intertidal zone. Destruction of the bottom habitats is only temporary however, since recolonization of the extended channel bottom would take place over time.

Disposal of the dredged material would take place on Grove Beach where it would be used for beach nourishment purposes. Dredging and disposal would cause temporarily increased levels in turbidity and resulting temporary degradation of water quality. Since the material is composed of predominantly clean materials, only limited release of sediment trapped pollutants is expected to occur. Reworking and washing of the disposed sand by waves, currents, and storms will take place before the summer season since construction would occur during the fall through early spring. Details of the plan are found in Appendix 2.

Impact on Navigation - Plan A would increase the width of the existing channel from 75 to 100 feet. This would provide one additional traffic lane in the main access channel from the confluence of the rivers to deep water in Long Island Sound. Since the Patchogue and Menunketesuck both have two lane traffic, the addition of a third lane to the existing access channel would reduce channel congestion and the probability of collisions and increase navigational efficiency by reducing time delays experienced by boaters attempting to enter and exit the harbor during the recreational boating season. The addition of one extra travel lane would reduce the travel time for a one-way passage of the fleet through the channel generating a 33% increase in fleet efficiency.

ECONOMIC IMPACTS

Dredging costs are based on using hydraulic methods with the dredged material being used to nourish Grove Beach.

The estimated first cost of Plan A is \$138,000. The annual cost is \$16,100 based on an interest rate of 7 5/8 percent amortized over a 50 year period. The annual project benefit, based on gains to recreational users and operating cost reductions to the commercial fleet is estimated at \$118,200.

Annual costs and benefits are as follows:

<u>Annual Costs</u>	<u>Annual Benefits</u>	<u>B/C Ratio</u>	<u>Net Benefits</u>
\$16,100	\$118,200	7.3	\$102,100

EVALUATION AND TRADEOFF ANALYSIS

Plan A provides an additional travel lane in the main access channel to increase fleet efficiency by decreasing the time delay in entering or exiting the harbor during the recreational boating season. The two lane entrance channel, currently handling two lanes of traffic from each river, would function more effectively and reduce congestion, with the addition of the third travel lane providing additional capacity during peak periods.

COST APPORTIONMENT

Based on the distribution of economic benefits the local share of the costs of the Federal project for Plan A is estimated at \$66,000 plus a 100 percent share of any related improvements that are not a part of the Federal project. Local interests would be required to bear all costs in excess of the \$2,000,000 Federal cost limitation.

PUBLIC VIEWS

Federal Agencies - Pending review of Detailed Project Report.

Non-Federal Agencies and Others - Pending Review of the Detailed Project Report.

PLAN B

PLAN DESCRIPTION

Plan B (shown on Figure 8) consists of increasing the width of the Federal channel from 75 to 125 feet from deep water in Long Island Sound to the confluence of the Patchogue and Menunketesuck Rivers, a distance of approximately 1,800 feet. The channel would be constructed to the existing depth of 8 feet at mean low water. The channel would be widened on the west side of the existing channel.

IMPACT ASSESSMENT

Dredging Impacts - Plan B involves the dredging of approximately 17,500 cubic yards of medium-fine and silty-sand, permanently altering 1.8 acres of river bottom and altering the depth of 0.06 acres of the inter-tidal zone. Destruction of the bottom habitat would be only temporary, since recolonization of the extended channel bottom would take place over time.

Disposal of the dredged material would take place on Grove Beach where it would be used for beach nourishment purposes. Dredging and disposal would cause temporarily increased levels in turbidity and resulting temporary degradation of water quality. Since the material is composed of predominantly clean materials, only limited release of sediment trapped pollutants is expected to occur. Reworking and washing of the disposed sand by waves, currents, and storms would take place before the summer season since construction would occur during the fall through early spring. Details of this plan are found in Appendix 2.

Impact on Navigation - Plan B would increase the width of the existing Federal channel from 75 to 125 feet. This would provide two additional travel lanes in the lower portion of the main access channel from the confluence of the rivers to deep water in Long Island Sound. As the Patchogue and Menunketesuck both have two lane traffic, the additional lanes in the lower portion of the channel would reduce traffic congestion and the probability of collisions and increase navigational efficiency by reducing time delays experienced by boaters attempting to enter and exit the harbor during the recreational boating season. The addition of these two travel lanes would reduce the travel time to pass the fleet into Long Island Sound and generates a 50% increase in navigational efficiency.

ECONOMIC IMPACTS

Dredging costs are based on using hydraulic methods with the dredged material being used to nourish Grove Beach.

The estimated first cost of Plan B is \$184,000. The annual cost, based on an interest rate of 7 5/8 percent is \$24,500 amortized over a 50-year period. The annual project benefit, based on gains to recreational users and operating cost reductions to the commercial fleet, is estimated at \$177,400.

Annual costs and benefits are as follows:

<u>Annual Costs</u>	<u>Annual Benefits</u>	<u>B/C Ratio</u>	<u>Net Benefits</u>
\$24,500	\$177,400	7.2	\$152,900

EVALUATION AND TRADEOFF ANALYSIS

Plan B provides two additional travel lanes in the lower main access channel to increase fleet efficiency by decreasing the time delay in entering or exiting the harbor during the recreational boating season. The two lane entrance channel, currently handling two lanes of traffic from each river, would function more effectively and reduce congestion with the additional travel lanes providing additional capacity during peak periods to match the capacity of the river channels feeding traffic into it.

COST APPORTIONMENT

Based on the distribution of economic benefits the local share of the costs of the Federal project for Plan B are estimated at \$ 88,000, plus a 100 percent share of any related improvements that are not a part of the Federal project. Local interests would be required to bear all costs in excess of the \$2,000,000 Federal cost limitation.

PUBLIC VIEWS

Federal Agencies - Pending review of Detailed Project Report.

Non-Federal Agencies and Others - Pending Review of the Detailed Project Report.

PLAN C

PLAN DESCRIPTION

Plan C (shown on Figure 9) involves widening the existing Federal channel from 75 to 150 feet from deep water in Long Island Sound to the confluence of the Patchogue and Menunketesuck Rivers, a distance of approximately 1800 feet. The channel would be constructed to the existing depth of 8 feet at mean low water. The channel would be widened on the west side of the existing channel.

IMPACT ASSESSMENT

Dredging Impacts - Plan C involves the dredging of approximately 25,000 cubic yards of medium-fine and silty-sand, permanently altering 2.7 acres of river bottom and altering the depth of 0.32 acres of the intertidal zone. Destruction of the bottom habitats is only temporary however, since recolonization of the extended channel bottom would take place over time.

Disposal of the dredged material would take place on Grove Beach where it would be used for beach nourishment purposes. Dredging and disposal would cause a temporary increase in turbidity levels resulting in temporary degradation of water quality. Since the material is composed of

predominantly clean materials, only limited release of sediment trapped pollutants is expected to occur. Reworking and washing of the disposed sand by waves, currents, and storms would take place before the summer season since construction would occur during the fall through early spring. Details of the plan are found in Appendix 2.

Impact on Navigation - Plan C would increase the width of the existing Federal navigation channel from 75 to 150 feet. This would provide three additional travel lanes in the lower portion of the main access channel from the confluence of the two rivers to deep water in Long Island Sound. As the Patchogue and Menunketesuck both carry two lane traffic, the additional lanes in the lower portion of the access channel would reduce traffic congestion and the probability of collisions. The addition of these extra lanes would reduce the travel time to pass the fleet into Long Island Sound.

ECONOMIC IMPACTS

Dredging costs are based on using hydraulic methods with the dredged material being used to nourish Grove Beach.

The estimated First cost of Plan C is \$225,000. The annual cost based on an interest rate of 7-5/8 percent amortized over a 50 year period is \$32,500. The annual project benefit, based on gains to recreational users and operating cost reductions to the commercial fleet is estimated at \$180,900.

Annual costs and benefits are as follows:

<u>Annual Costs</u>	<u>Annual Benefits</u>	<u>B/C Ratio</u>	<u>Net Benefits</u>
32,500	\$180,900	5.6	\$148,400

EVALUATION AND TRADEOFF ANALYSIS

Plan C provides three additional lanes in the lower main access channel to increase navigational efficiency by decreasing the time delay currently experienced by boaters entering or exiting the harbor during the recreational boating season. The two lane entrance channel, currently handling two lanes of traffic from each river, would function more effectively and reduce congestion with the additional travel lanes providing additional capacity during peak traffic periods. This plan provides the same outbound capacity as Plan B, but the fifth lane is expected to function less efficiently than Plan B during heavy inbound traffic periods since the five lane entrance channel would merge into four lanes of river traffic at the confluence of the Patchogue and Menunketesuck Rivers.

COST APPORTIONMENT

Based on the distribution of economic benefits the local share of the costs of the Federal project for Plan C are estimated at \$108,000, plus a 100 percent share of any related improvements that are not a part of the Federal project. Also, all spreading and grading of dredged material on the beach would be a local responsibility. Local interests would be required to bear all costs in excess of the \$2,000,000 Federal cost limitation.

PUBLIC VIEWS

Federal Agencies - Pending review of the Detailed Project Report.

Non-Federal Agencies and Others - Pending Review of the Detailed Project Report.

COMPARISON OF DETAILED PLANS

All of the proposed plans of improvement analyzed in detail are designed to increase the navigational efficiency of the Federal navigation project in Westbrook by reducing time delays experienced by those users attempting to navigate the system during the recreational boating season.

The Patchogue and Menunketesuck are physically small rivers. They have been heavily developed to the point where there will, inevitably, be some time delay factor to those users who choose to utilize this harbor during the recreational boating season. The optimum improvement is a plan that minimizes recreational time loss to the users while maximizing the benefits to be realized by the public.

All of the detailed plans utilize the beach nourishment option for the disposal of dredged materials. This achieves desired environmental and social goals, as the dredged material, being suitable for nourishment purposes, would be used to reestablish a severely eroded beach area, both enhancing the beach area and satisfying the desires of local officials and residents. The amount of material available for nourishment purposes varies from plan to plan. Plan A provides the least amount of material and Plan C the greatest quantity of material.

Plan A provides a total of three traffic lanes in the lower reach of the navigation channel to service the four lanes fed into it by the Patchogue and Menunketesuck Rivers, while Plan B provides for four lanes and Plan C provides five traffic lanes in the lower reach of the Federal channel.

All three plans increase the efficiency of the navigation system by reducing time delays to the fleet and thus reducing the amount of recreational time foregone by recreational users and also reduce the operating costs of the commercial fleet during the recreational boating season. The gain in recreational time varies with the plan selected, with Plan B generating the greatest gain in recreational time. The gains to the commercial fleet vary similarly. Since the benefits to the commercial fleet are reductions in operating costs the plan that produces the most efficient navigation system provides the optimal benefit to commercial operators.

Plan B provides four traffic lanes in the lower channel to match the four lanes of traffic fed into it from the Patchogue and Menunketesuck Rivers. This system is more efficient than Plan A as it offers more capacity in the entrance channel. Plan C offers the same efficiency as Plan B for the outbound traffic, but its inbound efficiency is reduced at the confluence of the Patchogue and Menunketesuck as five lanes of traffic merge into four, where, on the outbound cycle four lanes of traffic expand into five.

COST COMPARISON

Table 6 compares the cost of the three plans considered in detail. A detailed cost breakdown is found in Appendix 2. Table 6 also lists the annual charges associated with each detailed plan. In developing these annual charges, a Federal cost of 7 5/8 percent over a 50 year project life or recovery period was used.

TABLE 6
COST OF DETAILED PLANS

	<u>PLAN A</u>	<u>PLAN B</u>	<u>PLAN C</u>
Construction Costs			
Dredging	\$90,000	\$119,000	\$150,000
Contingencies (20%)	18,000	23,800	30,000
Engineering and Design	13,900	20,000	21,700
Supervision and Administration	15,000	20,100	22,200
Subtotal	<u>136,900</u>	<u>182,900</u>	<u>223,900</u>
Aids to Navigation	1,100	1,100	1,100
Total Construction Costs	<u>\$138,000</u>	<u>\$184,000</u>	<u>\$225,000</u>

ANNUAL CHARGES

	<u>PLAN A</u>	<u>PLAN B</u>	<u>PLAN C</u>
Interest & Amortization	\$ 10,800	\$ 14,400	\$ 17,600
Annual Maintenance	4,800	9,600	14,400
Aids to Navigation	500	500	500
Total Annual Cost	<u>\$ 16,100</u>	<u>\$ 24,500</u>	<u>\$ 32,500</u>

BENEFIT COMPARISON

As mentioned previously, each of the detailed plans would increase the navigational efficiency of the existing navigation system and reduce the amount of recreational time foregone by recreational users caused by congestion in the channel when large numbers of vessels attempt to use it simultaneously. This congestion is manifested in the form of delays which cause lost recreation time. Widening the lower channel results in faster and more orderly fleet movements that reduce travel delays and increase recreational time available to the user.

Furthermore, operating costs to local commercial fishermen would be reduced under each improvement plan as the fishermen would benefit by the reduced time delays and congestion in the navigation system.

Implementation of any of the alternatives is anticipated to reduce the frequency of collisions and groundings.

A detailed discussion of benefits is given in Appendix 3. However, a breakdown of annual benefits for the detailed plans is shown in Table 7.

TABLE 7
ANNUAL BENEFITS

	<u>PLAN A</u>	<u>PLAN B</u>	<u>PLAN C</u>
Value of Recreational Time Gain	\$113,400	\$170,200	\$173,600
Reduction in Operating Expenses	\$ 4,800 \$118,200	\$ 7,200 \$177,400	\$ 7,300 \$180,900

Table 8 lists the benefit-cost ratios for the detailed plans along with the net economic benefits for each plan, given on an annual basis.

TABLE 8
ECONOMIC IMPACTS

	<u>PLAN A</u>	<u>PLAN B</u>	<u>PLAN C</u>
B/C Ratio	7.3	7.2	5.6
Net Benefits	\$102,100	\$152,900	\$148,400

COMPARISON SUMMARY

Table 9, entitled "System of Accounts," is a general analysis relevant to plan selection. It presents the determinative factors that underlie each final alternative by displaying the significant beneficial and adverse impacts. This system is utilized for the purpose of tradeoff analysis and final decision making.

SELECTING A PLAN - ECONOMIC CONSIDERATIONS

Plan B is the alternative which maximizes net economic benefits. Net economic benefits are maximized when plan scale is optimized and the plan is efficient. Scale is optimized when the benefits of the last increment of output for each measure in the plan equals the economic costs of that increment. A plan is efficient when the outputs of the plan are achieved in a least cost manner.

Each of the alternative plans was evaluated according to its level of contribution to national economic development. The level of contribution is determined through summation of the benefits and adverse economic effects attributed to each plan. Benefits relative to improvement plans for the Patchogue River include gains to recreational users and reduced operating costs to commercial operators. Descriptions of the benefit and cost analysis of the economic and biological study areas, relative to each of the detailed plans is contained in Appendix 3. For the Patchogue River, the plan that optimizes scale and is efficient is the plan that affords the greatest improvement in navigational efficiency at the least cost. For the Patchogue River this is Plan B.

TABLE 9
SYSTEM OF ACCOUNTS

	NO ACTION	PLAN A	PLAN B	PLAN C
STRUCTURES - FEDERAL		Widen lower 1,800 feet of existing Federal channel from 75 to 100 feet	Widen lower 1,800 feet of existing Federal channel from 75 to 125 feet	Widen lower 1,800 feet of existing Federal channel from 75 to 150 feet
STRUCTURES - LOCAL	None	None	None	None
<u>IMPLEMENTATION COSTS</u>				
Federal				
Non-Federal				
QUANTIFIABLE TOTAL				
Average Annual Benefits				
Recreational Benefits		113,400	170,200	173,600
Commerical Benefits		4,800	7,200	7,300
Total		\$118,200	\$177,400	\$180,900
Average Annual Costs				
Interest and Amortization		10,800	14,400	17,600
Maintenance		4,800	9,600	14,400
Maintenance of Aids to Navigation		500	500	500
Benefit-to-Cost Ratio		7.3	7.2	5.6
Net Benefit		\$102,100	\$152,900	\$148,400
<u>ENVIRONMENTAL QUALITY</u>				
WATER QUALITY				
Turbidity at Dredge Site	N/A	Yes, Temporary	Yes, Temporary	Yes, Temporary
Short-Term Impact on Water Quality	N/A	Minor Degradation	Minor Degradation	Minor Degradation
Long-Term Impact on Water Quality	N/A	No Impact	No Impact	No impact
SHORELINE IMPACTS	N/A	Yes	Yes	Yes
Quantity of Material to be Dredged	0	10,000 yd ³	17,500 yd ³	25,000 yd ³

TABLE 9 (Cont).
SYSTEM OF ACCOUNTS

	NO ACTION	PLAN A	PLAN B	PLAN C
AIR QUALITY				
Increased Fuel Emissions From Construction	N/A	Yes	Yes	Yes
Short-Term Noise in Construction Area	N/A	Yes	Yes	Yes
Short-Term Marine Odor During Dredging Operations				
PLANTS				
Terrestrial Vegetation Destroyed	N/A	No	No	No
Aquatic Vegetation Destroyed	N/A	No	No	No
ANIMALS				
Wildlife Displaced	N/A	No	No	No
Wildlife Destroyed	N/A	No	No	No
Temporary Disruption of Fish Habitat	N/A	Yes	Yes	Yes
Permanent Disruption of Fish Habitat	N/A	No	No	No
Benthic Fauna Destroyed	N/A	Yes	Yes	Yes
LAND USE				
Intertidal Zone Lost	N/A	No	No	No
Commercial Land Use Disrupted	N/A	No	No	No
Residential Land Lost	N/A	No	No	No
Wildlife Area Lost	N/A	No	No	No
VISUAL APPEARANCE				
Loss of Aesthetics	N/A	No	No	No
Commercial Development Encouraged	No	Yes	Yes	Yes
Archaeological and Historical Value Lost	No	No	No	No
<u>SOCIAL WELL-BEING</u>				
Disrupts Recreational Activities	No	Minor, During Construction	Same as Plan A	Same as Plan A
Commercial or Residential Relocation Necessary	No	No	No	No

TABLE 9 (Cont).
SYSTEM OF ACCOUNTS

	NO ACTION	PLAN A	PLAN B	PLAN C
Decreases Risk of Vessel Collision	No	Yes	Yes	Yes
Disrupts Commerical Business Activities	No	Minor, During Construction	Same as Plan A	Same as Plan A
Project Makes Maximum Use of Existing Commerical Development	N/A	Yes	Yes	Yes
Disrupts or Overtends Police or Fire Departments	No	No	No	No
Displacement of People	N/A	No	No	No
Transportation	N/A	Minor Inconvenience to Traffic During Construction	Same as Plan A	Same as Plan A
Recreational Opportunities	N/A	Yes	Yes	Yes
<u>REGIONAL DEVELOPMENT</u>				
Supports Commerical Growth	No	Yes	Yes	Yes
Provides Service and Maintenance Facilities	Yes	Yes	Yes	Yes
Non-Federal Government Funds Required for Implementation of Portion of Project	N/A	Yes	Yes	Yes
<u>OTHER EVALUATED CRITERIA</u>				
Minimizes Adverse Impacts	N/A	Yes	Yes	Yes
Navigation Benefits Exceed Costs	N/A	Yes	Yes	Yes
Plan is Acceptable to Local Interests				
Plan is Acceptable to Private Interests				
Plan is Acceptable to other Federal Agencies				
Plan is Acceptable to State Interests				

SELECTING A PLAN - ENVIRONMENTAL CONSIDERATIONS

In considering the effects of a plan on the environment, it is recognized that environmental quality has both natural and human manifestations. Beneficial environmental contributions are made by preserving, maintaining, restoring, or enhancing the significant cultural and natural environmental attributes of the study area.

The waters of the Patchogue and Menunketesuck Rivers are presently classified by the State of Connecticut as Class A from their sources to tidewater. The tidewaters of these rivers are classified as SA but presently do not meet the standards for this classification. The character of Class A water is uniformly excellent; it may be suitable for drinking and/or bathing and all other uses. Class SA waters are suitable for all sea water uses including shellfish harvesting for direct human consumption (approved shellfish areas), bathing, and other water contact sports. They may be subject to absolute restrictions on the discharge of pollutants.

Although there are no identified point source wastewater discharges to the Patchogue or Menunketesuck Rivers for which National Pollution Discharge Elimination System permits are required, the estuary has been closed for shellfishing due to bacterial contamination in excess of acceptable standards of purity (median total coliform count greater than 70 organisms per 100 milliliters expressed in terms of most probable numbers in any series of samples collected under various existing conditions). Bacterial pollution in the estuary and tidal flats could originate from several sources, including septic tank/leaching field systems, overland stormwater runoff, and fecal wastes discharged from pleasure craft using the harbor. Also, Westbrook has no municipal sewerage system; therefore, the built-up areas along the rivers and near the beaches may be contributing to pollution of the harbor.

The bacterial pollution problem which necessitated the shellfishing closure is apparently confined mainly to the Patchogue River, where coliform levels have been observed to rise in the vicinity of the center of town.

It should be noted that the bacterial standards for shellfish waters are stringent because of public health considerations, but this does not necessarily imply that the lower reaches of the Menunketesuck and Patchogue Rivers are heavily polluted. The Department of Environmental Protection has monitored water quality in the Menunketesuck River for the past several years during the summer months. Results from the sampling station at the U.S. Route 1 bridge over the river show consistently high dissolved oxygen, near saturation levels, and low turbidity. Although no comparable monitoring has been conducted on the Patchogue River, it is likely that similarly good quality water would be found, except, perhaps, with regard to coliform bacteria.

In summary, the Patchogue and Menunketesuck Rivers have moderate water quality problems in the tidal reaches specifically related to high coliform counts.

In evaluating the alternative plans considered in this study the plan which would have the least impact on the existing river and harbor conditions is Plan A. Plan A would alter the least amount of river bottom (0.9 acres) and only alter the depth of 0.01 acres of the intertidal zone, while providing approximately 10,000 cubic yards of material for beach nourishment purposes. Therefore, Plan A, which involves the minimum amount of dredging has the minimal environmental impact.

RATIONALE FOR THE SELECTED PLAN

Plan B is the selected plan. Of the three alternative plans considered in detail, Plan B provides the maximum net benefits while it also has a limited impact upon the environment at the project location.

RECOMMENDED PLAN

Based on the applicable engineering, economic and environmental criteria, Plan B, (shown on Figure 10) consisting of widening the existing Federal channel from 75 to 125 feet from deep water in Long Island Sound to the confluence of the Patchogue and Menunketesuck Rivers, a distance of 1,800 feet is the recommended plan. The modification would be constructed to the existing authorized depth of 8 feet MLW. The plan will require dredging approximately 17,500 cubic yards of material that will be used for beach nourishment at Grove Beach.

The total construction investment for the recommended plan is estimated to be \$184,000. Annual benefits that would result from the recommended plan, principally a decrease in the amount of recreational time foregone, amount to \$177,400 which when compared to annual charges of \$24,500 yield a benefit-cost ratio of 7.2.

FINDING OF NO SIGNIFICANT IMPACT

The recommended navigation improvement at Patchogue River is Plan B which consists of widening the entrance channel to 125 feet while maintaining the existing 8-foot depth from deep water in Long Island Sound to the confluence of the Patchogue and Menunketesuck Rivers. The proposed action will result in the excavation of approximately 17,500 cubic yards of material.

The proposed project would alleviate the "bottleneck" effect due to the inadequacy of the inlet channel width to handle the large volume of traffic which presently exists. This situation has proven to be a safety hazard which results in boating accidents and delays.

The decision to prepare an Environmental Assessment was based on the following considerations:

- . An analysis of the bottom material indicates that it would be suitable for either ocean or land disposal.

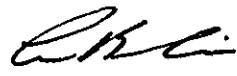
- . The dredge sediments are to be placed on Grove Beach, as local interests and the U. S. Fish and Wildlife Service, as well as the Connecticut DEP and CAM favor this method of disposal.

- . Environmental and social impacts would be minimal.

Coordination and consultation with appropriate Federal and State agencies ensured that their concerns and recommendations were identified to the Corps so that they could be addressed during construction planning.

I have determined that this project can be constructed with insignificant adverse impacts and that proceeding with development of the project is in the best overall interest of the public.

17 Dec 82
DATE



CARL B. SCIPLE
Colonel, Corps of Engineers
Division Engineer

CONCLUSIONS

As Division Engineer of the New England Division, Corps of Engineers, I have reviewed and evaluated in the overall public interest all pertinent data concerning the proposed plan of improvement, as well as the stated views of other interested agencies and the concerned public relative to the various practical alternatives for providing navigation improvements to the Patchogue River, Westbrook, Connecticut.

The proposed consequences of alternatives have been studied according to engineering feasibility, environmental impacts, economic factors of regional and national resource development and other considerations of social well-being in the public interest. The ramifications of these issues have been stated in detail in the formulation of this plan of improvement and in other sections of this report.

In summary, there are substantial benefits to be derived by providing the recreational boating and commercial fishing interests along the Patchogue River with adequate access.

The improvement would cause a minor disruption of the environment during dredging and disposal operations. However, the Environmental Assessment did not identify any significant impact sufficient to warrant the development of an environmental impact statement. Due to the benefits attributable to recreational boating and the commercial fishing industry it is considered that this minor adverse impact to the environment would be more than offset by improvement to the overall economic growth of the region.

I find that the proposed action, as developed in this report, is based on a thorough analysis and evaluation of the various practical alternative courses of action for achieving the stated objectives; and that wherever adverse effects are found to be involved, they cannot be avoided by following reasonable alternatives and still achieve the specified purposes; and that where the proposed action has an adverse effect, this effect is either ameliorated or substantially outweighed by other considerations. The recommended action is consistent with national policy, statutes and administrative directive, and should best serve the interest of the general public.

RECOMMENDATION

The Division Engineer recommends that modification of the Federal navigation project at the Patchogue River, Westbrook, Connecticut, be authorized by the Chief of Engineers under the provisions of Section 107 of the 1960 River and Harbor Act, as amended.

The project would provide an access channel 8 feet deep extending from deep water in Long Island Sound to the confluence of the Patchogue and Menunketesuck Rivers, a distance of 1,800 feet, at a width of 125 feet. The total cost for the project is presently estimated at \$184,000 to be shared by the Federal government and the Town of Westbrook. Annual maintenance costs are estimated to be \$10,100. The recommendation is made subject to the conditions that local interests will:

- Provide a cash contribution of 48 percent of the cost of construction, presently estimated to be \$88,000.

- Provide, maintain and operate without cost to the United States, an adequate public landing with provisions for the sale of motor fuel, lubricants and potable water, open and available to the use of all on equal terms.

- Provide without cost to the United States all necessary lands, easements and rights-of-way required for construction and subsequent maintenance of the project including suitable dredged material disposal areas with necessary retaining dikes, bulkheads, and embankments.

- Hold and save the United States free from damages that may result from construction, operation and maintenance of the project, except for damages due to the fault or negligence of the United States or its contractors.

- Accomplish without cost to the United States alterations and relocations as required in sewer, water supply, drainage and other utility facilities.

- Provide and maintain berths, floats, piers, and similar marina and mooring facilities as needed for transient and local vessels as well as necessary access roads, parking areas, and other needed public-use shore facilities, open and available to all on equal terms.

- Assume full responsibility for all project costs in excess of the Federal cost limitation of \$2 million dollars.

- Establish regulations prohibiting discharge of untreated sewage, garbage, and other pollutants in the waters of the harbor by users thereof. These regulations shall be in accordance with applicable laws or regulations of Federal, State and local authorities responsible for pollution prevention and control.

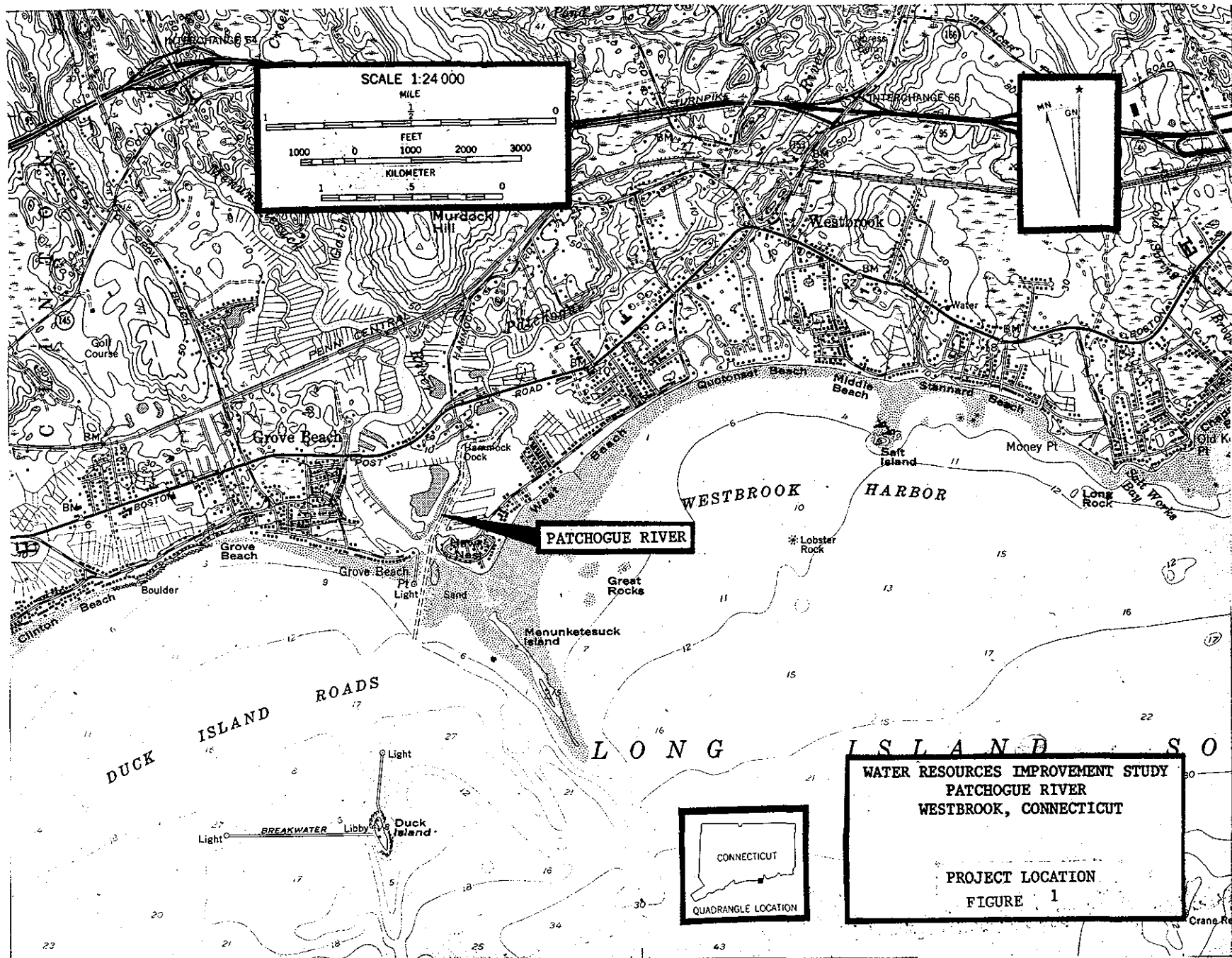
ACKNOWLEDGEMENT AND IDENTIFICATION OF PERSONNEL

The preparation of this report was administered by:

Carl B. Sciple, Colonel, Division Engineer
Joseph L. Ignazio, Chief, Planning Division
Donald Martin, Chief, Coastal Development Branch
Richard J. DeSimone, Chief, Small Navigation Projects Section

Study management and plan formulation was directed by the Project Manager, Michael Misslin. The Environmental Assessment was prepared by Gilbert Chase and Susan Brown; the Economic Analysis was developed by Richard Ring; and the engineering analyses were performed by William Coleman and Timothy Beauchemin.

The New England Division is appreciative of the cooperation and assistance rendered in connection with this study by personnel of other Federal agencies, by State and regional agencies, and municipal authorities.



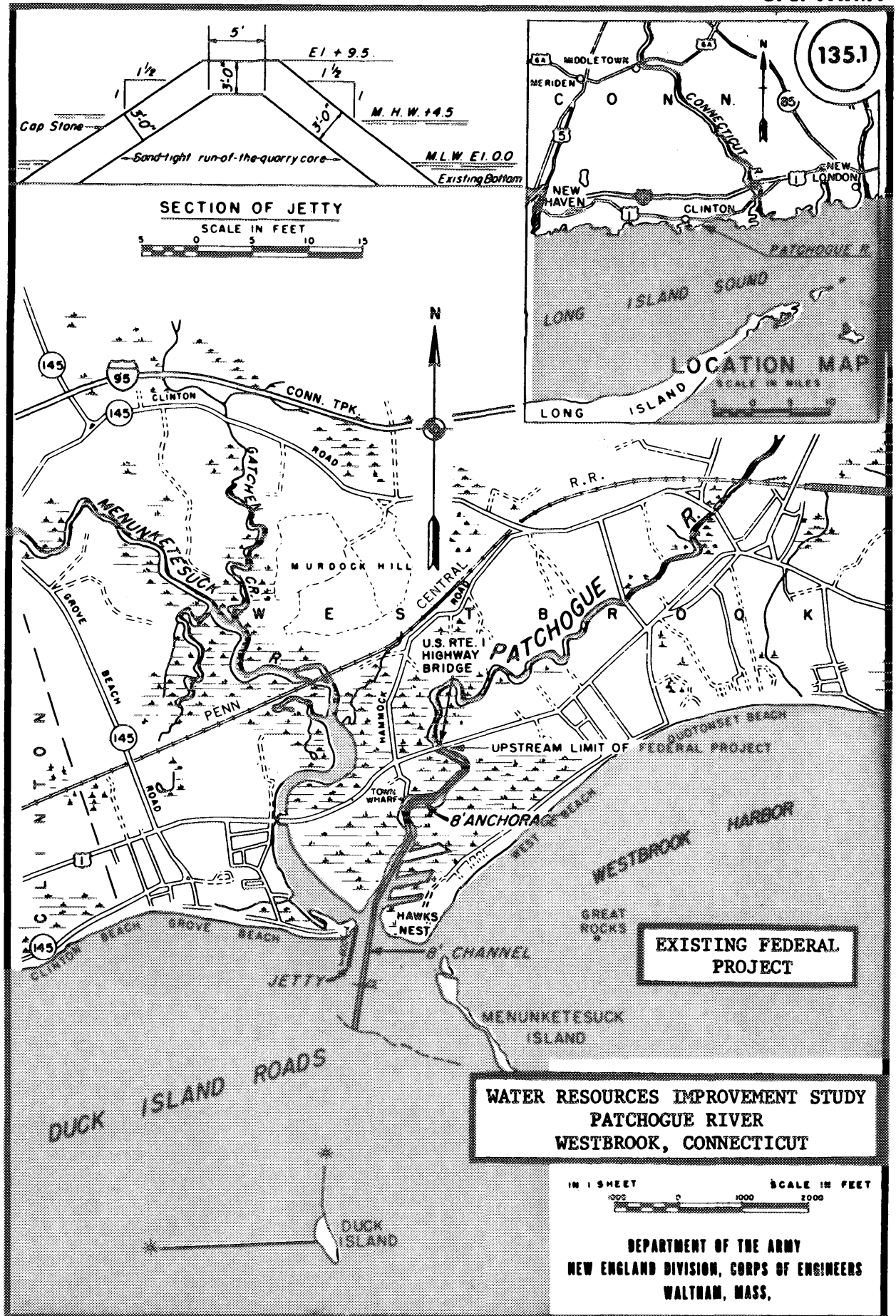


FIGURE 2

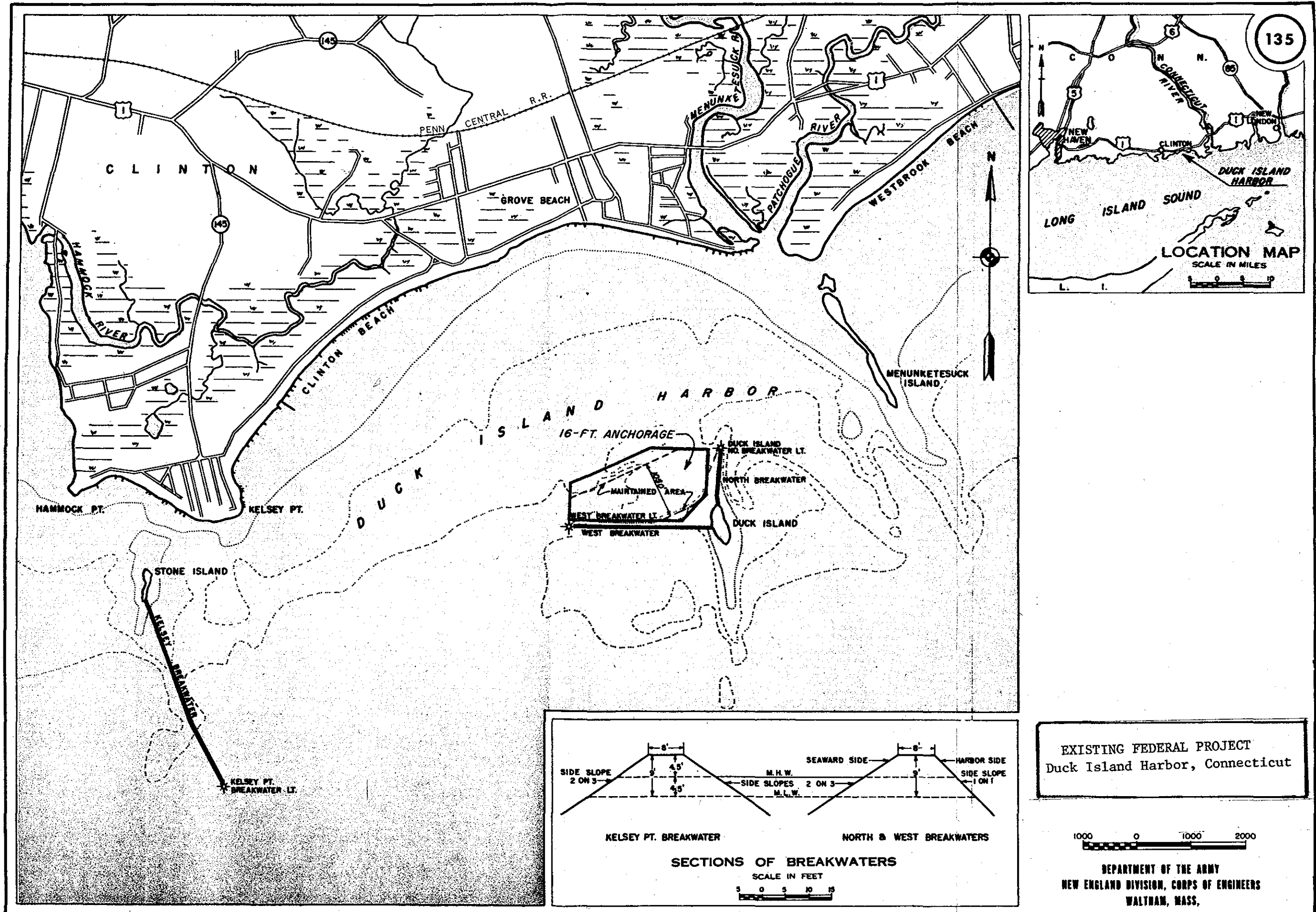
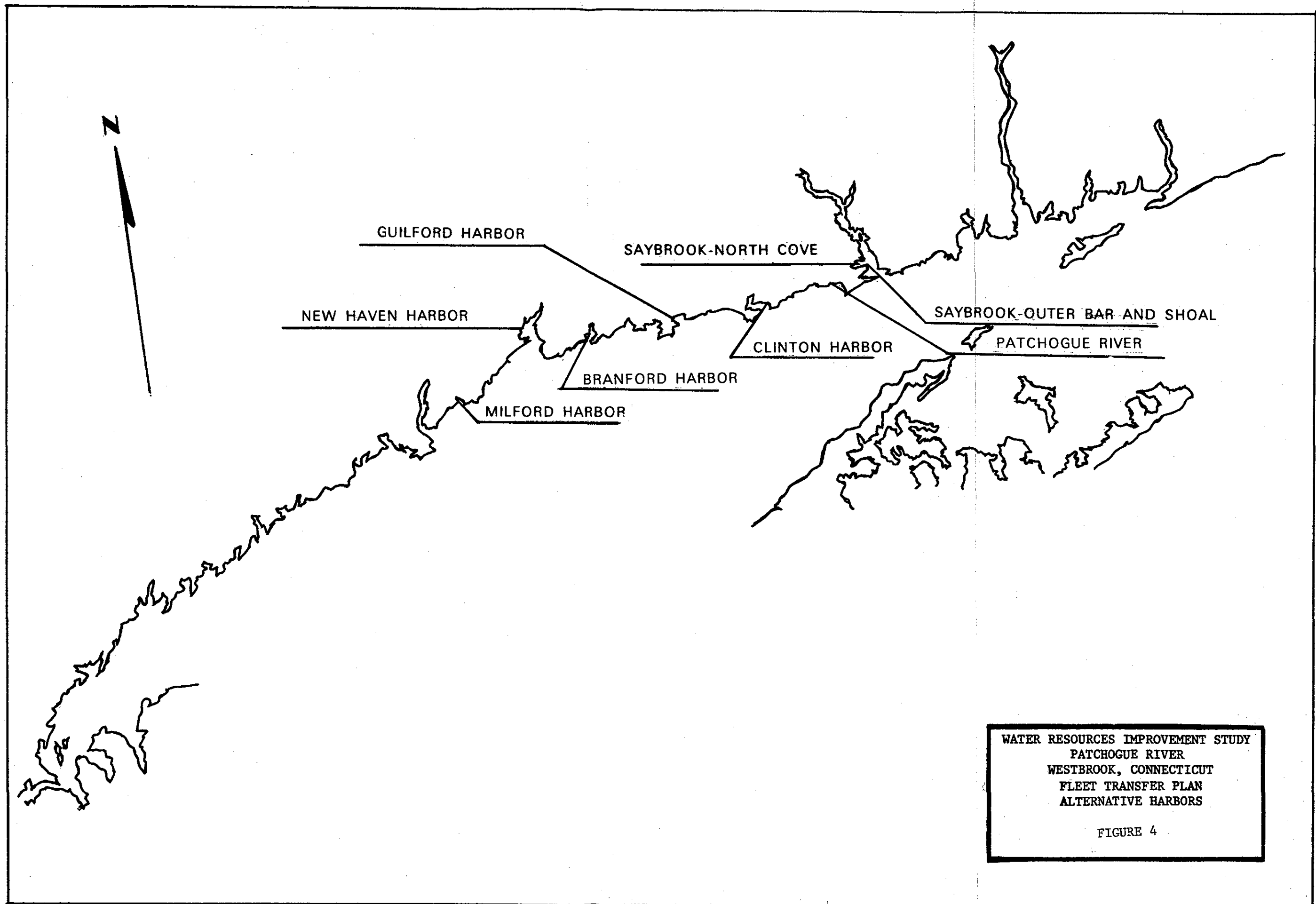
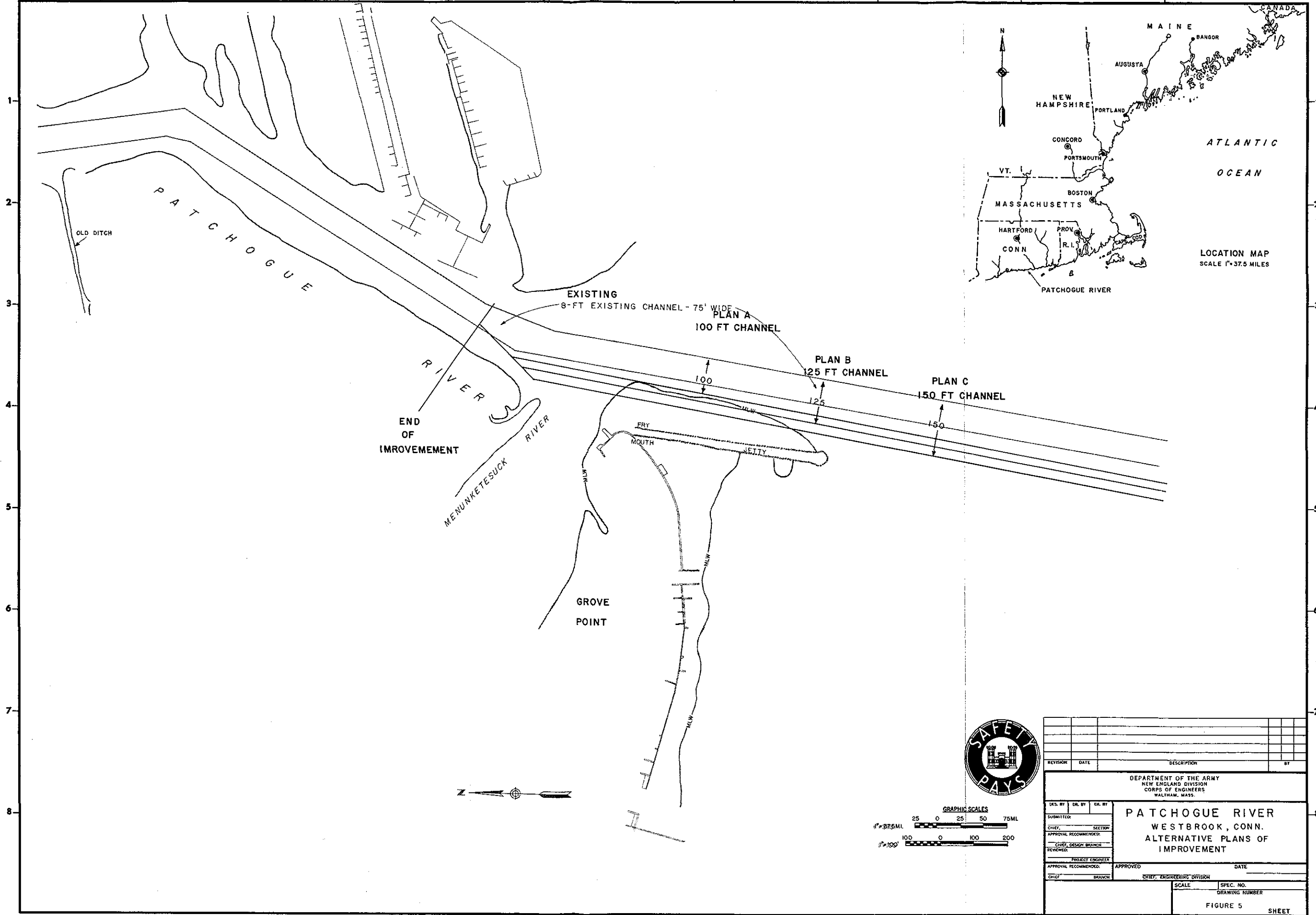


FIGURE 3



WATER RESOURCES IMPROVEMENT STUDY
PATCHOGUE RIVER
WESTBROOK, CONNECTICUT
FLEET TRANSFER PLAN
ALTERNATIVE HARBORS

FIGURE 4



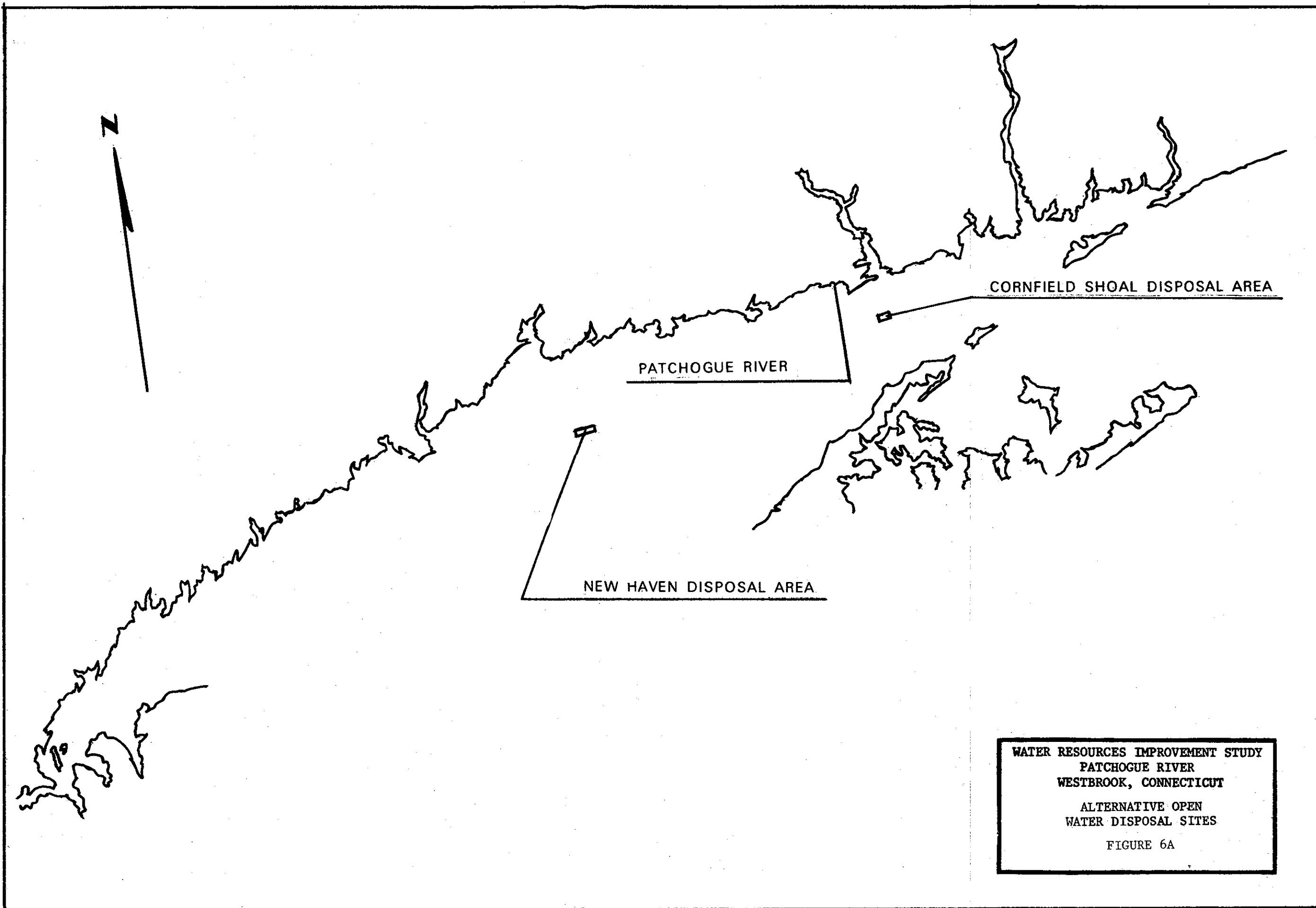
REVISION	DATE	DESCRIPTION	BY

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

**PATCHOGUE RIVER
WESTBROOK, CONN.
ALTERNATIVE PLANS OF
IMPROVEMENT**

DES. BY	DR. BY	CH. BY
SUBMITTED:		
CHECK:	SECTION	
APPROVAL RECOMMENDED:		
CHECK, DESIGN BRANCH		
REVIEWED:		
PROJECT ENGINEER		
APPROVAL RECOMMENDED:	APPROVED	DATE
CHECK	BRANCH	CHIEF, ENGINEERING DIVISION
SCALE	SPEC. NO.	DRAWING NUMBER

FIGURE 5 SHEET



WATER RESOURCES IMPROVEMENT STUDY
PATCHOGUE RIVER
WESTBROOK, CONNECTICUT
ALTERNATIVE OPEN
WATER DISPOSAL SITES
FIGURE 6A

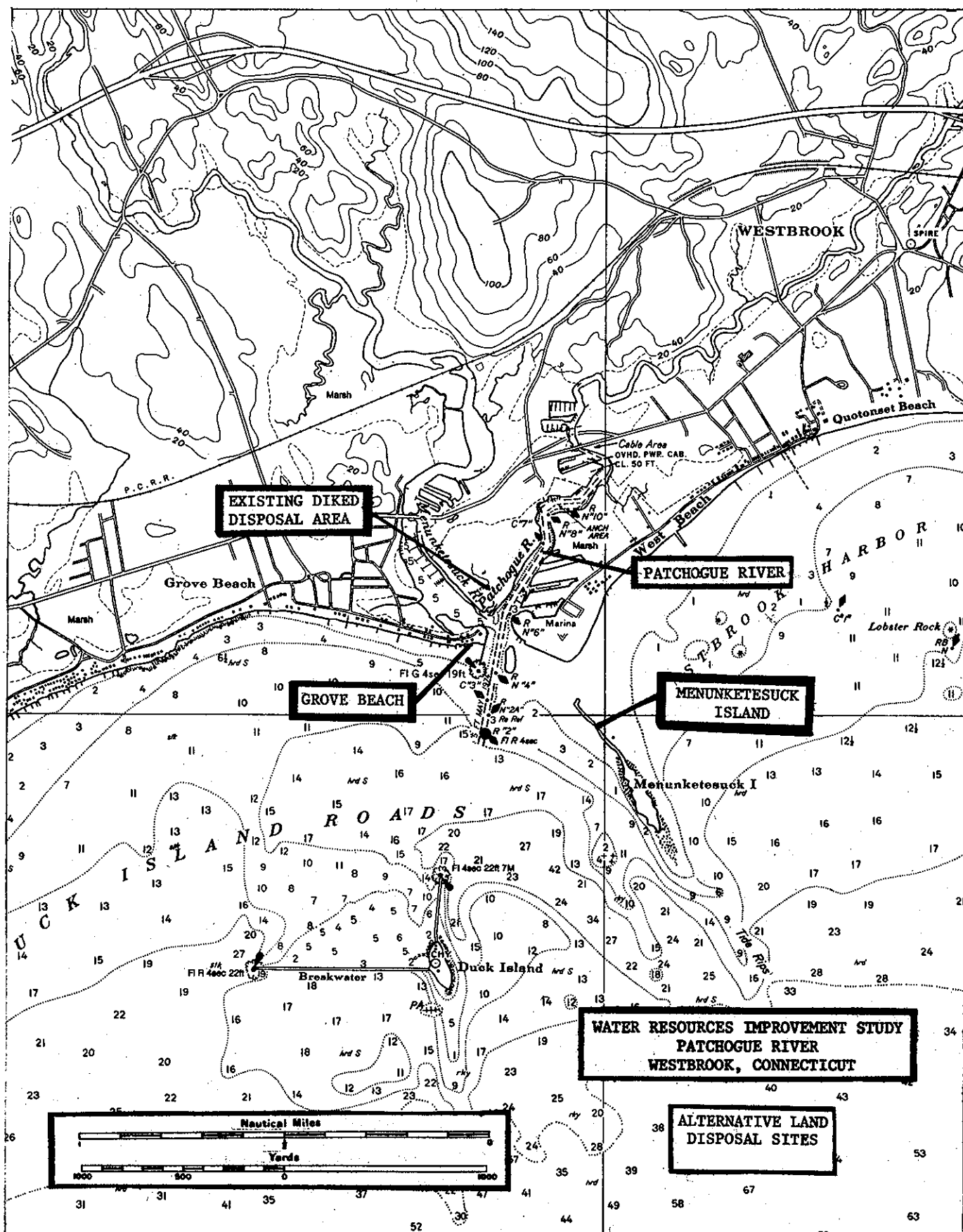
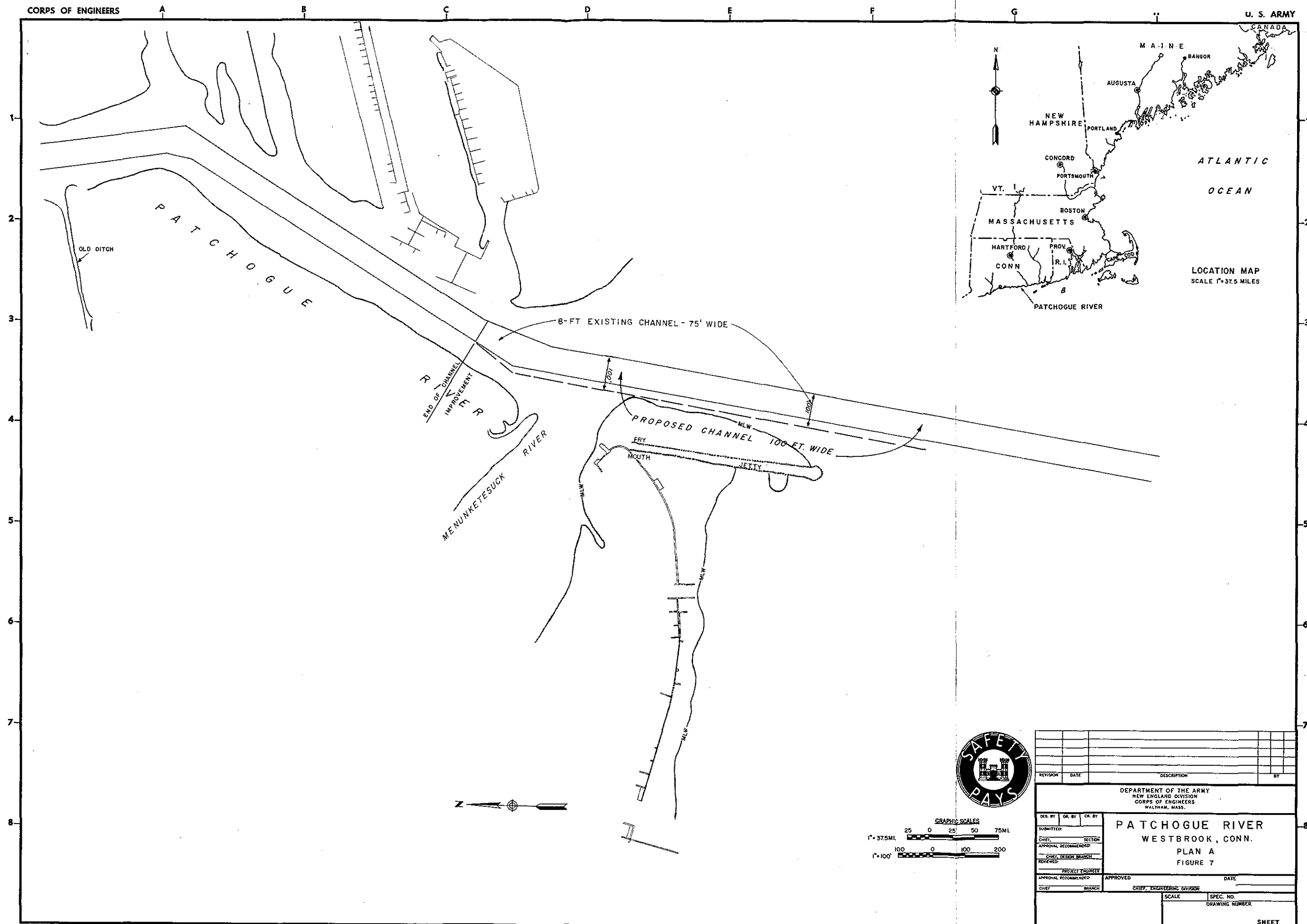


FIGURE 6B



GRAPHIC SCALES
1"=37.5 MI. 0 25 50 75 MI.
1"=100' 0 100 200

REVISION	DATE	DESCRIPTION	BY

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NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

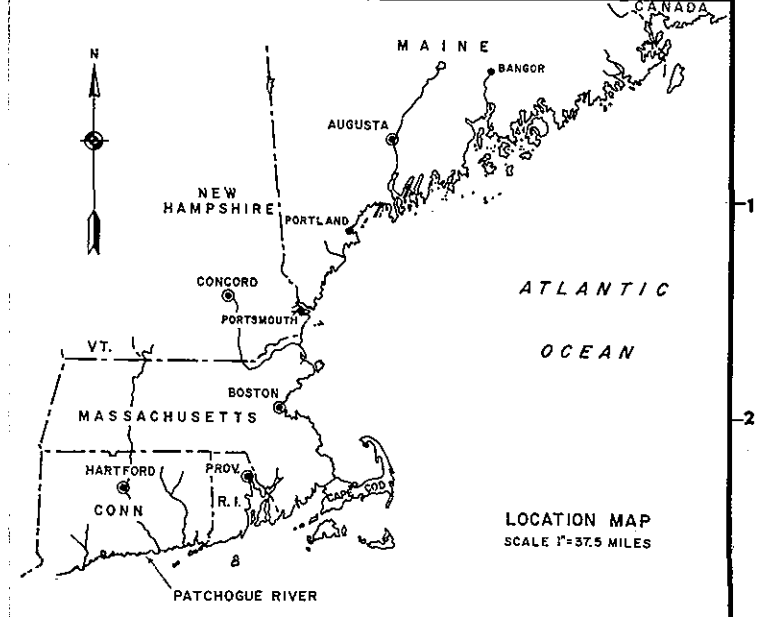
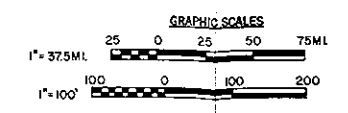
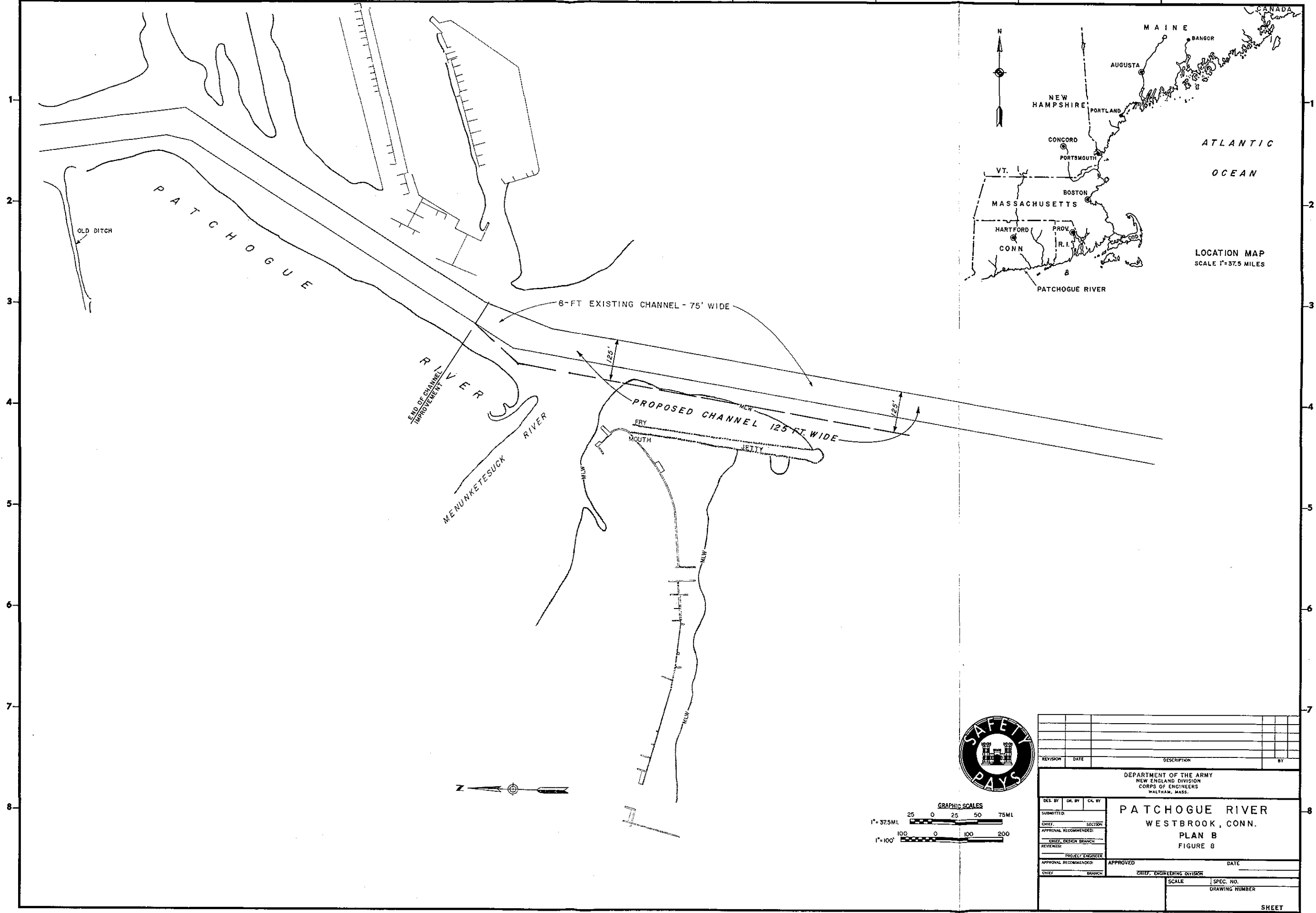
PATCHOGUE RIVER
WESTBROOK, CONN.
PLAN A
FIGURE 7

DES. BY	CHK. BY	DATE

APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
REVIEWED
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, ENGINEERING DIVISION

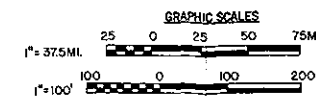
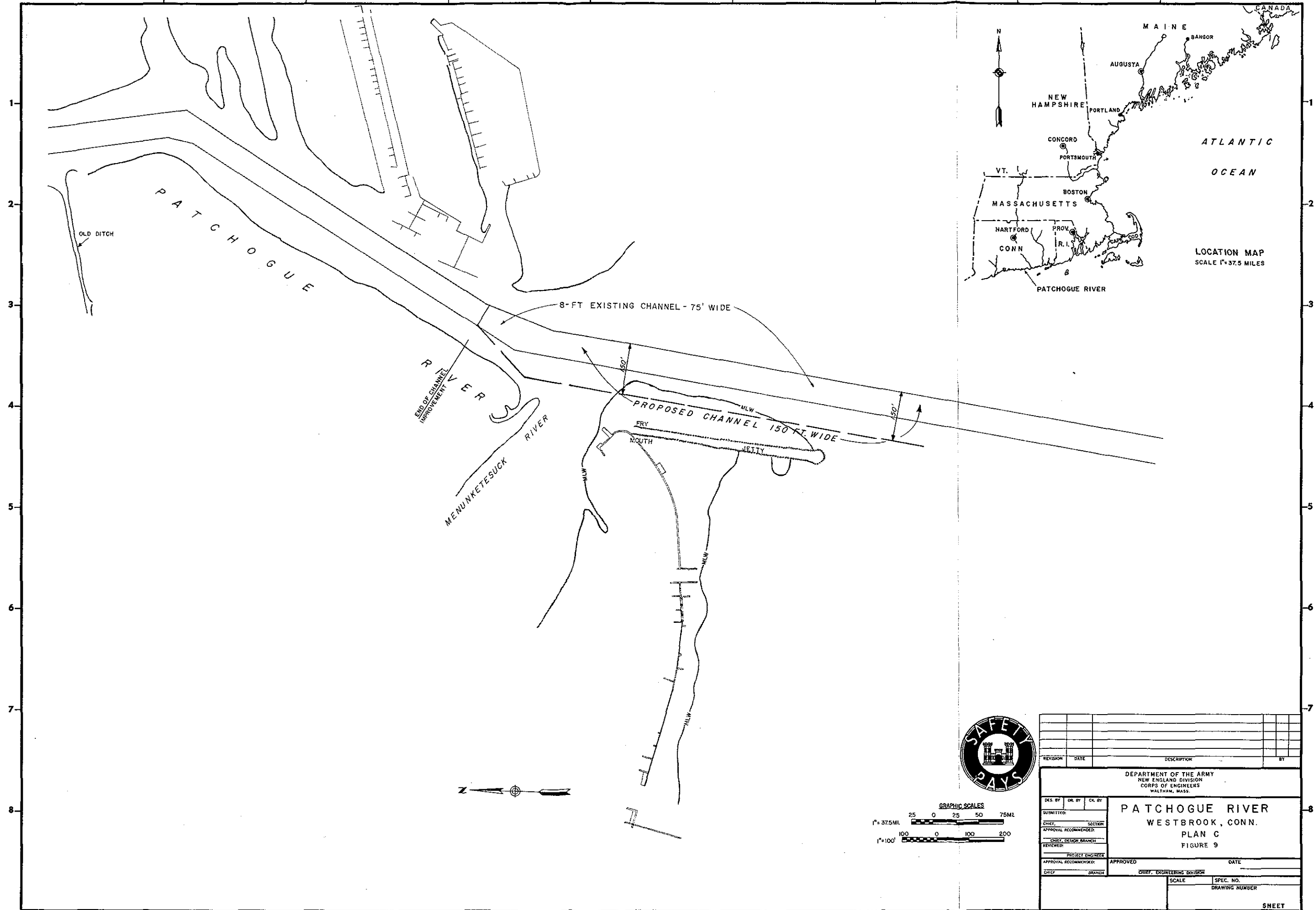
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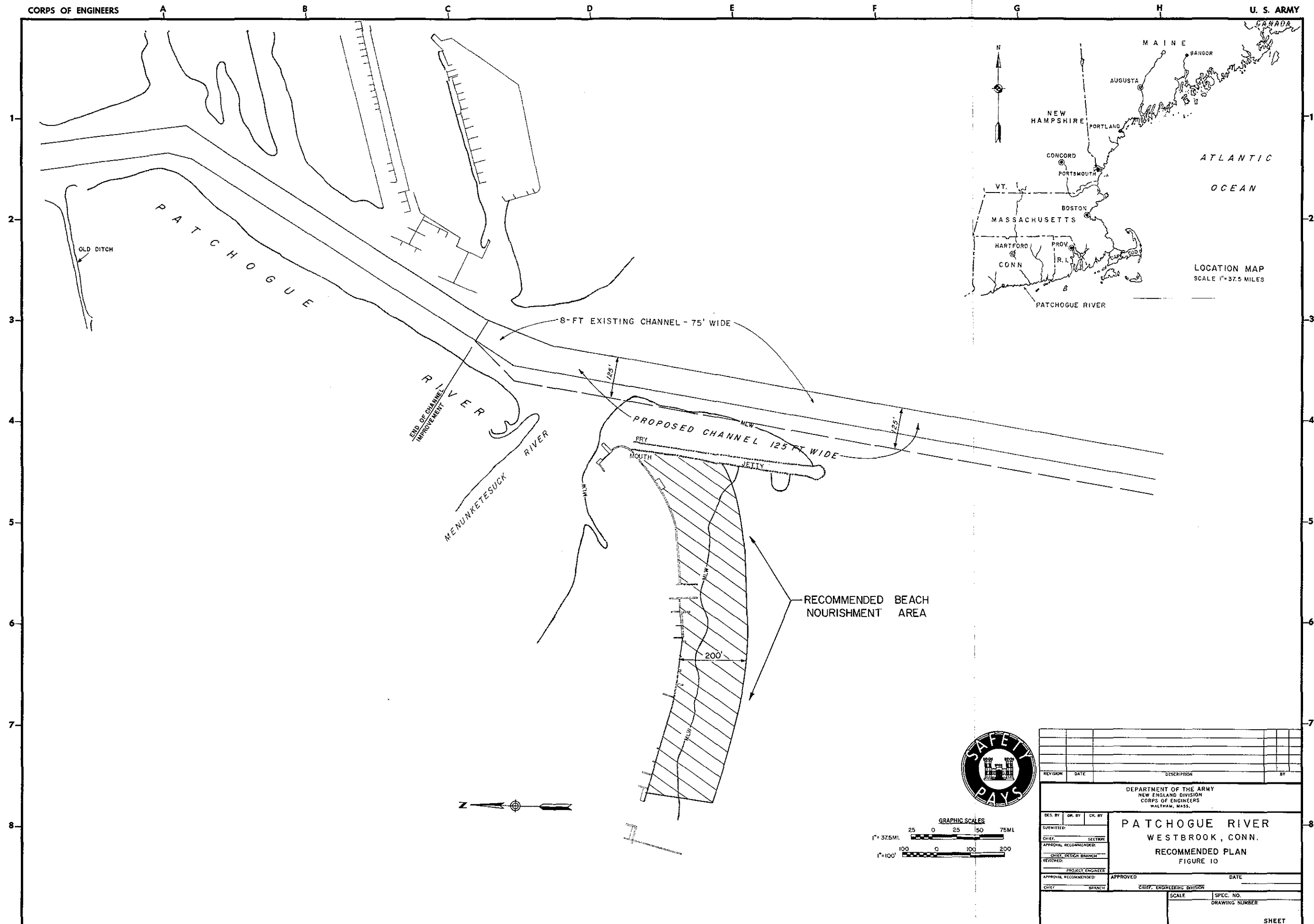
REVISION	DATE	DESCRIPTION	BY

DEPARTMENT OF THE ARMY NEW ENGLAND DIVISION CORPS OF ENGINEERS WALTHAM, MASS.			
DES. BY	CHK. BY	CL. BY	
SUBMITTED:			
CHIEF, SECTION			
APPROVAL RECOMMENDED:			
CHIEF, DESIGN BRANCH			
REVIEWER:			
PROJECT ENGINEER			
APPROVAL RECOMMENDED:	APPROVED	DATE	
CHIEF, BRANCH	CHIEF, ENGINEERING DIVISION		
	SCALE	SPEC. NO.	
		DRAWING NUMBER	
SHEET			



REVISION	DATE	DESCRIPTION	BY

DEPARTMENT OF THE ARMY NEW ENGLAND DIVISION CORPS OF ENGINEERS WALTHAM, MASS.					
DES. BY	OR. BY	CK. BY	PATCHOGUE RIVER WESTBROOK, CONN. PLAN C FIGURE 9		
SUBMITTED:					
CHIEF, SECTION					
APPROVAL RECOMMENDED:					
CHIEF, DESIGN BRANCH					
REVIEWED:			PROJECT ENGINEER	APPROVED	DATE
CHIEF, ENGINEERING DIVISION					
SCALE	SPEC. NO.		DRAWING NUMBER		
SHEET					



ENVIRONMENTAL ASSESSMENT
AND 404 EVALUATION
PATCHOGUE RIVER, WESTBROOK, CONNECTICUT
NAVIGATION CHANNEL IMPROVEMENT DREDGING

APPENDIX 1

NEW ENGLAND DIVISION
U.S. ARMY CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

APPENDIX 1

ENVIRONMENTAL ASSESSMENT

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ENVIRONMENTAL ASSESSMENT
PATCHOGUE RIVER, WESTBROOK, CONNECTICUT
NAVIGATION CHANNEL IMPROVEMENTS DREDGING

INTRODUCTION AND PROJECT HISTORY

In keeping with the National Environmental Policy Act of 1970, the New England Division Army Corps of Engineers has examined environmental values as part of the planning and development of the proposed action plan. Background environmental information was compiled for purposes of this report through interviews with various state and local interest groups and a search of published literature.

From the time the existing Federal project in Patchogue River was completed in 1956 to the present, recreational boating activities have increased dramatically. This unexpected growth has resulted in considerable difficulty with vessel maneuverability within the existing Federal channel, particularly at the inlet, beginning where the Menunketesuck River and Patchogue River converge and extending to deep water. As a result of this situation, the town of Westbrook requested, through meetings and in a letter dated 11 February 1975, that the Corps of Engineers conduct a reconnaissance study to determine if there is a feasible solution to this problem and if a further detailed investigation of the matter is justified. This report is an environmental assessment of the improvements proposed and alternatives considered.

Patchogue River is a small tidal stream, 3 miles long, situated in the town of Westbrook, Connecticut on the north shore of Long Island Sound, 7 miles west of the mouth of the Connecticut River. It combines with the Menunketesuck River, immediately above its mouth and empties into Duck Island Roads, just west of Menunketesuck Island and 1 mile north of Duck Island.

The water approach from the south through Duck Island Roads has a controlling depth in excess of 9 feet extending to within 1500 feet of the mouth of the Patchogue River. From this point the channel shoals rapidly. Depths within the river vary from tidal flats to over 11 feet. The inlet to the river is approximately 200 feet wide. A 75-foot wide, 8-foot deep channel extends a distance of about 5,200 feet from deep water in Duck Island Roads to the highway bridge on U.S. Rt. 1. A jetty extending southerly from the west side of the mouth of the river protects the entrance channel from filling with sand as a result of natural littoral drift. An 8 foot deep anchorage opposite the town wharf provides refuge to commercial and recreational vessels. The mean range of tide in Patchogue River is 4.5 feet and the spring range is 5.3 feet.

I. PURPOSE AND NEED FOR ACTION

1.00 The main navigation difficulty at Patchogue River is the inadequacy of the inlet channel width to handle the large volume of traffic which now exists, thus creating a "bottleneck" in the area where the Patchogue River and Menunketesuck River converge and extending seaward

along the entire length of the entrance channel. This situation has proven to be a safety hazard which results in boating accidents, groundings and delays. The problem may be alleviated by widening the inlet channel as suggested by local interests.

1.01 The recommended channel improvement plan would provide for the creation of a 125-foot wide entrance channel having a controlling depth of 8 feet. This plan is shown on Figure 10 following the main report. The plan would entail the widening of the existing 75-foot wide entrance channel to 125 feet by dredging. The proposed 125-foot wide channel would extend from deep water in Duck Island Roads to about the first bend in the existing Federal channel, a distance of about 1800 feet. The proposed dredging to an 8 foot depth with a one foot overdepth (O.D.) allowance would yield approximately 17,500 cubic yards of material.

1.02 Construction Methods

1.03 Improvement dredging of the Patchogue River Channel would be performed by a hydraulic dredge. Dredging would start at the upper end of the project in the vicinity of the confluence of the Patchogue and Menunketsuck Rivers in order to place fine material under the coarser sand of the outer reach. (Fig 1). Dredged material would be pumped to the disposal site by pipeline. The dredging would be scheduled around the peak periods for shellfish spawning and anadromous fish species spawning runs.

1.04 Disposal Site

1.05 It is proposed to dispose of dredged material on the beach on the west side of the jetty, and Grove Beach, which protects the entrance channel. Spreading and final placement of the material would be a local responsibility. Recent (1981) grain-size analysis of sediments to be dredged from five station locations show a high percentage of sand content for three of the five stations surveyed. Four of the samples (A, B, C, and D) were obtained from the proposed entrance channel dredge area and consisted of 86%, 17%, 86%, and 99% sand, respectively. Results of bulk chemical analysis for two stations (B-GP-1, E-PF-1) are given in Table 1-1. In contrast, sample E collected approximately 900 feet upstream from the proposed improvement area showed a much higher percentage of fine sediment (71% silt and 25% clay) and organic content. Sample E is exhibited for comparison purposes only. Although it is within the existing Federal project area, it was taken outside of the proposed improvement dredging area. The concentrations of the parameters tested may be classified as Class I material according to the Connecticut-New York and NERBC Interim Plan for Disposal of Dredged Material from Long Island Sound and as such would be suitable for disposal in either open-waters of the sound or for beach nourishment. Results of elutriate tests which simulate hydraulic dredge disposal operations, revealed some minor releases of ammonia, vanadium, and manganese but the concentrations of all parameters fall below current EPA Criteria for the Section 307(a)(1) toxic pollutants (Federal Register, Nov. 28, 1982).

TABLE 1-1

Patchogue River Bulk Sediment
Analysis for Entrance Channel - 1981

Visual Classification	<u>B-GP-1</u>	<u>E-PF-1</u>
	Dark Gray, Gravelly M-F Sands to F Sandy Clayey Silt	Dark Gray Organisms Clayey Silt and Silty Clay
% Solids	59.6	33.3
% Vol. Solids - EPA	4.42	7.40
% Vol. Solids - NED	2.85	5.51
COD ppm	36,373	82,960
TKN ppm	1,200	3,430
Oil & Grease	500	146
Hg ppm	0.1	0.1
Pb ppm	<20	<20
Zn ppm	59	54
As ppm	2.2	6.3
M ppm	137	135
Cd ppm	<2.5	<2.5
Cr ppm	43	46
Cu ppm	11	11
Ni ppm	<20	<20
Silver ppm	9	<5
V ppm	<75	<75
% Total Carbon	0.78	3.11
% Hydrogen	<0.10	0.31
% Nitrogen	0.12	0.65
DDT ppb	<0.01	<0.03
PBC's ppb	<0.01	<0.03

Note: Sample B-GP-1 is taken from the proposed dredge area in the entrance channel and sample E-PF-1 was collected approximately 900 feet upstream from the mouth of the Patchogue River and exhibits a higher organic content. Both samples, however, fall within Class I of the bi-state disposal criteria.

TABLE 1-2
ELUTRIATE TESTING - Patchogue River, Conn. 1981

Results of tests performed on: (1) the standard elutriate prepared from one part sediment taken at various sampling locations with four parts water from each sampling location and (2) the virgin water from each sampling location are as follows:

	Dredge Site Water	Standard Elutriate Designation and Sediment Depth Used in Preparation			Dredge Site Water	Standard Elutriate Designation and Sediment Depth Used in Preparation		
	<u>B-EW-#2</u>	<u>B-GP-#1; Surface</u>			<u>B-EW-#1</u>	<u>E-PF-#4; 0.0-1.0</u>		
		R-1	R-2	R-3		R-1	R-2	R-3
Nitrate/Nitrite Nitrogen(N), ppm	0.08	0.07	0.13	0.05	0.05	0.07	0.13	0.05
Ammonia nitrogen (N), ppm	0.15	0.22	0.47	0.35	0.25	7.1	6.0	6.0
Sulfate (SO ₄), ppm	2,300	2,400	2,200	2,200	2,200	2,200	2,200	2,100
Oil and Grease, ppm	<0.2	0.7	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total Phosphorus (P), ppm	0.05	<0.5	<0.5	<0.5	0.6	0.5	<0.5	0.07
Mercury (Hg), ppb	<1		<1	<1	<1	<1	<1	<1
Lead (Pb), ppb	101	102	95	94	99	101	94	90
Zinc (Zn), ppb	<30	<30	<30	<30	48	<30	50	<30
Arsenic (As), ppb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cadmium (Cd), ppb	69	64	73	99	86	63	60	58
Chromium (Cr), ppb	<2	<2	<2	<2	<2	<2	<2	<2
Copper (Cu), ppb	31	44	38	40	34	33	31	11
Nickel (Ni), ppb	456	282	294		267	697	731	
Silver (Ag), pbb	<1	<1	1	<1	<1	1	<1	<1
Vanadium (V), ppb	142	292	300	244	174	243	241	239
Total PCB, ppb	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Total DDT, ppb	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Manganese, ppb	11	82	137	251	11	2,540	2,470	2,960

Note: Sampe E-PF-4 was taken upstream, out of dredge area and is included for comparison purposes.

1.06 The project was last dredged during the period of 11 April to 18 May, 1977 when approximately 36,500 cubic yards of material was pumped to the land disposal site located at the confluence of the Patchogue and Menunketesuck Rivers. During this dredging operation an attempt was made to provide some advance maintenance by excavating twenty-five (25 feet) along each side of the channel.

II. ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.00 In considering the protection and navigational needs of the existing and future commercial and recreational fleets at Patchogue River, the following alternative plans of improvements were evaluated:

Plan A: Widen channel to 100 feet from deep water in Long Island Sound to the confluence of the Patchogue and Menunketesuck Rivers.

Plan B: Widen channel to 125 feet from deep water in Long Island Sound to the confluence of the Patchogue and Menunketesuck Rivers.

Plan C: Widen channel to 150 feet from deep water in Long Island Sound to the confluence of the Patchogue and Menunketesuck Rivers.

2.01 Dredging Requirements

The following table summarizes the dredging requirements for each of the alternative channel widths and depths studied. In each case, the volumes include a one (1) foot overdepth.

TABLE 1-3

<u>PLAN</u>	<u>DREDGING YARDAGE</u>
A	10,000 cy
B	17,500 cy
C	25,000 cy

2.03 Annual maintenance dredging was estimated using the three maintenance contracts since the project was constructed in 1956. The average shoaling rate for this period is 0.4 feet per year. The following table assumes that the shoaling rate is independent of the channel depth and that shoaling is uniform throughout the channel length. It was further assumed that the cost of dredging would be \$8.00 per cubic yard of material.

TABLE 1-4

<u>Plan</u>	<u>Dredging</u>	<u>Cost</u>
A	600 cy	\$ 4,800
B	1,200 cy	\$ 9,600
C	1,800 cy	\$14,400

2.04 Dredged Material Disposal Options

2.05 Alternative disposal areas for dredged materials from Patchogue River may be categorized as beach nourishment, diked land area, open water in Long Island Sound or island nourishment/habitat enhancement in Long Island Sound.

2.06 Beach Nourishment

2.07 Grove Beach. The preferred disposal option is to hydraulically dredge the sediments and pump them via pipeline to the west of the existing Federal jetty along Grove Beach. In terms of beach nourishment, the Corps of Engineers suggests that the characteristics of sandfill should be somewhat coarser than exist on the present beaches. It should consist of a well-graded material having a median diameter of not less than .40mm, consistent within practical and economic limits. Maximum diameter can range as high as 2 mm and still remain within the classification of medium beach sand satisfactory for bathing purposes. Clean dredged sand once deposited on the beach is left for reworking by tide storms and currents. By conducting the project in late fall or winter, there would be minimum impacts to biological organisms and maximum likelihood that the beach profile would be restored by the following summer. Grain size analysis of sediment samples show that the existing beach composition is medium-fine brown sands with the mean grain size ranging from 0.21 to 0.50 mm in diameter. Sediment samples from the channel to be dredged shows that the material is comprised predominantly of sand (86-99%) which would be compatible for beach nourishment.

2.08 Land Disposal

2.09 The land disposal site extends over 9.5 acres of an 11 acre disposal area located at the confluence of the Patchogue and Menunketesuck Rivers. This confined disposal area was last utilized in the spring of 1977 when 36,500 cubic yards were maintenance dredged and deposited at the site.

Menunketesuck Island. Some environmental interests with the Connecticut Dept. of Environmental Protection have expressed a desire to have the dredged sands deposited on the northern end of the island to mitigate erosion processes and to create habitat for least tern colonies which nest on the island. The island was formerly a tombolo connected to the west side (Grove Beach) of the channel. It is reported (Ron Rozsa, Conn. DEP/CAM Per. Comm.) that 82 pair of least terns currently use the site. The environmental effects associated with this disposal option are viewed as insignificant. This island is privately owned and the State or local interests would be responsible for securing permission to utilize the site.

2.10 No Action

2.11 Beneficial Aspects of No Action. The expected adverse environmental impact of the proposed action is minimal; therefore, with the exception of beach nourishment, there are no other applicable beneficial environmental aspects to the no action alternative.

2.12 Adverse Impacts of No Action. Failure to modify the navigation project would allow congestion to continue, thus limiting the usefulness of the project. Maintenance of the present channel dimensions would perpetuate groundings and potentially serious accidents.

2.13 Rejection Reasoning of No Action. The adverse impacts of the no action alternative, are thought to outweigh the beneficial aspects in terms of overall public interest.

2.14 Open Water Disposal Sites Long Island Sound

2.15 A clamshell or bucket dredge and scows would be employed to remove the material from the project to an ocean disposal area in Long Island Sound. Two sites have been identified as possible disposal sites, these being Cornfield Shoal and New Haven (or the Central Long Island) Dumping Grounds.

2.16 The Cornfield Shoal Dumping Grounds is described as one nautical mile square (with sides running true north-south and east-west) the center of which is 5,930 yards from Saybrook Breakwater Light on a bearing of 198°-15' True. This site is located approximately 51 x 16 nautical miles southeast of Patchogue inlet. Point dumping would be employed in a natural depression 170 feet deep. The area surrounding this site is highly active and considered a dispersal environment.

2.17 New Haven Dumping Grounds

2.18 The New Haven Dumping Grounds are located in central Long Island Sound, centered at approximately 41°-08'-45" north latitude and 72°-53'-15" west longitude, about 6 nautical miles (NM) south of the entrance to New Haven Harbor, Connecticut.

2.19 The site is comprised of silts and clayey silts with less than 20 percent sand. The bottom is relatively featureless and slopes gently to the south and is an environment of net sediment deposition. Existing water depths range from 15 to 23 meters. Maximum tidal currents at the bottom are moderate (27-31 cm/sec) and wave induced currents are low.

2.20 Between March 1974 and October 1979, 1.5 million cubic yards of material from New Haven and Guilford Harbors were dumped at this site. This material formed a symmetrical mound at the center of the disposal site; the minimum depth of water above the pile was 15 to 15.5 meters. After the New Haven project was completed additional material from private

projects under Federal permit was dumped at a buoyed point southwest of the original site. There was no disposal at this site from 1975 until 1977. From March 1979 to June 1980, 470,000 c.y. of spoils from Stamford and New Haven Harbors were dumped at two points 0.5 NM north and south of the central mound. This operation formed mounds with 18.5 and 19.5 meters of water above, respectively. Approximately 275,000 c.y. of material from the Federal project in Norwalk Harbor was dumped at a site approximately 0.5 NM west of the central mound in 1980-81.

III. Environmental Consequences

3.00 In evaluating the material to be dredged, the guidelines for Section 404 of the Federal Water Pollution Control Act Amendments of 1972 were applied. In accordance with these guidelines, dredged or fill material may be excluded from chemical-biological testing if it falls within any of the following categories:

a. The dredged or fill material is composed predominantly of sand, gravel, or any other naturally occurring sedimentary material with particle size larger than silt, characteristic of and generally found in areas of high current or wave energy such as streams with large bed loads or coastal areas with shifting bars and channels.

b. The dredged or fill material is for beach nourishment or restoration and is composed predominantly of sand, gravel, or shell with particle sizes compatible with material on receiving shores.

c. The material thus meets the criteria established for exclusion from chemical-biological testing. As mentioned earlier in Sections 1 and 2, the elutriate and bulk sediment test results satisfy EPA water quality and State disposal criteria.

3.01 As a result of sediment disruption organic material could enter the water. However, because organics are not a major constituent of sediment samples (Table 1-1), impacts are expected to be minor. Again, tidal flushing would eliminate any substantial decrease in dissolved oxygen which might occur as a result of organic input feeding estuarine biota.

3.02 As dredged material would be pumped onto a beach area, a loss will occur among sand burrowing biota such as amphipods. However, this should only be a short term event, with recolonization occurring rapidly. As dredged material will undoubtedly contain some organics, a foul hydrogen sulfide odor may be prevalent for a short period of time after exposure. Hydrogen sulfide is a normal end product of anaerobic decomposition which occurs in marine sediment, however, once the sediments are exposed to air and high tides, hydrogen sulfide would be gradually terminated as an aerobic population of decomposers is established or these materials are washed away.

3.03 Because dredged material would not be isolated from surrounding marine water (below Mean High Water) certain materials are expected to reenter the marine environment. According to a study by Windom (1972) on the effects of hydrologic dredging on water quality, ammonia is the constituent released to the greatest extent. A large increase in ammonia brings about a rapid increase in phytoplankton and benthic algae communities. This is generally the case when the disposal discharge enters the water directly. A large phytoplankton bloom is not expected though with beach disposal as dilution would eliminate any potential problem and runoff would be minimal. As ammonia is derived from certain organics and proteins, and the dredged material is relatively low in organics, this impact should be minor. The dredged material would actually be placed above mean high tidal zone.

3.04 As dredging activities would proceed seven days a week, 24 hours a day, noise would become a definite environmental impact. However, dredging would only occur over a short period of time, thus this noise would only be a short term impact. The proposed dredging and beach disposal would not alter the present use of lands adjacent to the channel.

3.05 Analysis of Bottom Sediments. Sediment samples taken in 1971, 1975, and 1981 (see Figure 12) revealed the predominance of sand at stations located south of the stone jetty. Because of their location, these stations are subject to greater exposure to longshore currents and wave action, thus the presence of sand can be attributed to littoral drift along the shoreline. Overall, sediment quality in the Patchogue River appears to be similar to that of other harbors on the north shore of Long Island Sound. Organic content at the inner stations, although fairly high, is nevertheless typical of productive, sheltered estuaries that receive considerable amounts of organic detritus from tidal wetlands and upland sources. The sands characterizing the inlet would be satisfactory for beach nourishment as proposed.

3.06 Effects of Turbidity and Siltation. In the Patchogue River, oyster (*Crassostrea virginica*) and hard clams (*Mercaenaria mercenaria*) represent a potentially important resource, even though the area is currently closed to shellfishing. Soft-shelled clams are also present in the estuary, though in lesser abundance. Considerable research has been directed toward the effects of turbidity and siltation on these and other shellfish species. Sherk and Cronin¹⁴, in their extensive literature review of sedimentation effects on estuarine organisms, consistently found oysters to be "remarkably silt tolerant." Both the hard clam and soft clam, are active burrowers and are thus not especially vulnerable to damage from the amounts of turbidity and siltation associated with dredging. The most important shellfishing areas in the town of Westbrook are not in the project area, but rather in Westbrook Harbor and on the east side of Menunketesuck Island where extensive clam bars and oyster beds are found. These areas would not be affected by the proposed dredging project. With a hydraulic dredge the sediments placed into suspension by the cutterhead are sucked into the pipeline and transported

to the disposal site. Hence, relatively little actual turbidity is created by this dredging method unless the discharge is directed back in the water column.

3.07 Beneficial Impacts of the Project. The major impact of widening the channel that leads from the confluence of the Patchogue and Menunketesuck Rivers to Long Island Sound will be a reduction of vessel congestion and delays which now characterize the area. With over 1,800 recreational craft and 21 commercial fishing vessels using the channel, numerous delays occur with regularity as the result of groundings and traffic volume.

3.08 Under existing channel conditions, it is estimated that the value of recreation time foregone is approximately \$340,400 annually and increased operating expenses to the commercial fishing vessel totals \$14,400. Implementation of one of the improvement plans under consideration would increase channel width thereby allowing more efficient navigation of the channel. A decrease in delay time and value would occur in one of the following amounts: Plan A (33.3%), Plan B (50%), and Plan C (50%).

IV. Affected Environment

4.01 Socioeconomic Data. The coastal areas of central Connecticut are in general experiencing more rapid growth than inland sections. The town of Westbrook had a population increase of 59.2 percent between 1960 and 1970, compared with growth rates of 29.2 percent for Middlesex county and 19.6 percent for the State as a whole in the same period. Table 1-5 shows recent population trends of coastal towns in the vicinity of the Patchogue River.

Table 1-5: Population Statistics for the Patchogue River Area

Town	1980	1970	1960
Westbrook	5,216	3,820	2,399
Clinton (borders Westbrook on west)	11,195	10,267	4,166
Old Saybrook (borders Westbrook on east)	9,288	8,468	5,274

4.02 In spite of the rapid growth of these coastal towns, the area is still predominantly rural, particularly in inland sections. The town of Westbrook itself has little manufacturing industry. Recreational boating and related commercial enterprises thus comprise a large segment of the

local economy. The town's population increases significantly in the summer due to the influx of seasonal residents and boaters. However, few summer homes and cottages have been built in the town in recent years due to the high cost and dwindling supply of coastal lots. In 1970, there were an estimated 1,960 seasonal housing units in Westbrook,¹ concentrated for the most part south of the Boston Post Road (U.S. Route 1) on lots as small as one-quarter acre. A trend of converting summer homes to year-round use has been in evidence for a number of years, which in some cases has led to problems with overloading or failure of subsurface sewage disposal systems.

4.03 Access to the project area is provided by the well developed system of highways, including the Connecticut Turnpike (I-95) and U.S. Route 1, which parallels the Connecticut coast and Routes 9 and Interstate 91 from Hartford and points to the north.

4.04 Marine Facilities. Extensive recreational and some commercial use is made of the area encompassing the Patchogue River. In recent years, there have been around 7,300 commercial vessel trips annually.

These vessels are responsible for approximately 111 tons of commerce a year, principally fresh fish and shellfish. Twenty-one fishing vessels are based on the river.

4.05 Recreational traffic is heavy and has increased significantly in recent years. Recreational craft drawing up to 5 feet of water recorded 16,275 trips in 1970, while 1973 and 1974 saw boats with drafts up to 6 feet take approximately 21,000 and 25,600 recreational trips, respectively.

4.06 There are 13 marinas in Westbrook, all served by the Federal channel in the Patchogue River. The marinas in turn provide dockage and services for an estimated 1,800 boats. This figure, according to the chairman of the harbor commission, does not include (a) those located further up the Patchogue and Menunketesuck Rivers (north of U.S. Route 1), (b) those that are sold each year, and (c) those that are launched at any of three local boat launching ramps.² The total annual usage for the Patchogue River channel is probably close to 2,000 or 2,500 boats. Among the equipment provided by the marinas are a marine railway, 50 ton travel lifts, and one small travel lift.

4.07 Large-scale marine development in Westbrook began essentially with improvement dredging of the Patchogue River in 1956. The lower Menunketesuck River was not extensively developed for recreational boating until the 1960's. Dredging of a 6-foot channel in the Menunketesuck was done entirely by private interests. Discussions with local marina operators indicate that the demand for boating facilities currently exceeds the supply; some of the marinas have long waiting lists for slips and expect they could fill essentially any new spaces they could develop. This shortage of boating slips has repercussions throughout the

local boating economy, as boat sales are more difficult if docking space cannot be guaranteed with the purchase.³

4.08 The local harbor commission has estimated that the number of boats will eventually level off at around 2,000, which is a reasonable estimate of the potential marina capacity in the Patchogue and Menunketesuck Rivers. On the Patchogue River some boat basin space on the east side of the channel has not yet been developed, and there is also room for possible expansion of facilities on the west side of the Patchogue River channel as well as in the Menunketesuck River.

4.09 Water Resources. Both the Patchogue and Menunketesuck Rivers have been classified by the State of Connecticut, Department of Environmental Protection as Class A waters from their sources to tidewater. The tidewaters of these two rivers are classified as SA but do not presently meet the standards for this classification.

4.10 The character of Class A water is uniformly excellent; it may be suitable for drinking and/or bathing and all other water uses. It may be subject to absolute restrictions on the discharge of pollutants. Authorization of new discharges of other than minor cooling and clean water would require revision of the classification to Class B which would be considered concurrently with the issuance of a permit at a public hearing.

4.11 Class SA waters are suitable for all sea water uses including shellfish harvesting for direct human consumption (approved shellfish areas), bathing, and other water contact sports. They may be subject to absolute restrictions on the discharge of pollutants; authorization of new discharges other than cooling or clean water may require revision of the classification to Class SB which would be considered concurrently with the issuance of a permit at public hearing.

4.12 Although there are no identified point source wastewater discharges to the Patchogue or Menunketesuck Rivers for which National Pollution Discharge Elimination System permits are required, the estuary has been closed for shellfishing due to bacterial contamination in excess of acceptable standards of purity (median total coliform count greater than 70 organisms per 100 milliliters expressed in terms of most probable numbers in any series of samples collected under various existing conditions). Bacterial pollution in the estuary and tidal flats could originate from several sources, including septic tank/leaching field systems, overland stormwater runoff, and fecal wastes discharged from pleasure craft using the harbor. Also, Westbrook has no municipal sewerage system; therefore, the built-up areas along the rivers and near the beaches may be contributing to pollution of the harbor. The town's Director of Health noted that the significant sanitation problem of the town occurs in the high density cottage areas concentrated along the shorefront.⁴ However, the bacterial pollution problem which necessitated the shellfishing closure is apparently confined mainly to the Patchogue

River, where coliform levels have been observed to rise in the vicinity of the center of town.⁵

4.13 It should be noted that the bacterial standards for shellfish waters are stringent because of public health considerations, but this does not necessarily imply that the lower reaches of the Menunketesuck and Patchogue Rivers are heavily polluted. The Department of Environmental Protection has monitored water quality in the Menunketesuck River for the past several years during the summer months. Results from the sampling station at the U.S. Route 1 bridge over the river show consistently high dissolved oxygen, near saturation levels, and low turbidity. Although no comparable monitoring has been conducted on the Patchogue River, it is likely that similarly good quality water would be found, except, perhaps, with regard to coliform bacteria.

4.14 A regional study of sewerage needs in Westbrook and nine other towns in south-central Connecticut is being conducted under Section 201 of the Federal Water Pollution Control Act Amendments of 1972. The resulting facilities plan will contain a program for upgrading water quality in the town and will undoubtedly assign a high priority to the coastal and central sections where septic tank problems are most severe.

4.15 Most of the development south of Route 1 is served by the Connecticut Water Company in Clinton, and little use is made of groundwater in this area.

4.16 Climate and Tidal Regime. Westbrook has a variable and temperate climate moderated by Long Island Sound and the Atlantic Ocean. Mean temperatures in the area vary widely, from about 29°F in January to around 71°F in July, with extremes over a considerably wider range. The freeze free period averages slightly more than 180 days. The mean annual precipitation of approximately 48 inches is fairly evenly distributed throughout the year.

4.17 Storms producing high winds, heavy rainfall, and abnormally high tides occur with unpredictable frequency. The coastal area of central Connecticut is exposed to continental and coastal storms as well as thunderstorms of local or frontal origin. Continental storms originating over the United States and southern Canada can be expected at any time of year. Tropical hurricanes ordinarily are experienced in the months June through October. The potential for storms is important with regard to recreational use of the Patchogue River. Local boating officials have expressed concern over the possibility of a severe storm occurring on a peak summer recreational weekend. Under such circumstances, with difficult navigation conditions and hundreds of power and sail boats attempting to get back into the harbor quickly, the risk of groundings or serious accidents is increased substantially. In addition, the relatively narrow width of the entrance channel (75 feet but reduced by shoaling) makes it very difficult at times for one boat to pass another, especially when heading in the same direction.

4.18 In Long Island Sound, the height of each tide varies during the lunar month and the time interval for a complete tide cycle averages about 12 hours, 25 minutes. This results in the daily occurrence of two low and two high waters on an average of six out of seven days. At Duck Island, located in Long Island Sound about one mile offshore from the mouth of the Patchogue River, the mean tidal range is 4.5 feet and the spring range is 5.2 feet.

4.19 Geologic and Topographic Setting. The coast of Connecticut marks the southern limit of the New England Seaboard physiographic region, which varies in width from 6 to 16 miles and is underlain by sandstone, shale, slate and granite. Topography in the project area varies from flat to gently rolling within a mile or so of the coast, whereas irregular low hills predominate in the more northerly headwater areas of the Patchogue and Menunketesuck Rivers. The highest elevation in Westbrook is approximately 210 feet and is located in the northwest corner.

4.20 Vegetative Cover and Wildlife. Forest vegetation in the coastal region of Connecticut is typified by associations of white oak (Quercus alba), northern red oak (Quercus rubra) and hickory with interspersions of white pine (Pinus strobus) and hemlock (Tsuga canadensis) south of the Boston Post Road (U.S. Route 1) in Westbrook virtually no forested land remains, but a majority of the area in central and northern sections of town is still woodland.

4.21 Associated with the Patchogue and Menunketesuck Rivers are considerable amounts of both tidal and freshwater wetlands. As defined in Connecticut Public Act No. 695 concerning the preservation of wetlands and tidal marsh and estuarine systems, wetland means:

those areas which lie beneath tidal waters, such as, but not limited to banks, bogs, salt marsh, swamps meadows, flats, or other low lands subject to tidal action, including those areas now or formerly connected to tidal waters, and whose surface is at or below an elevation of one foot above local extreme high water; (and upon which some of nineteen different species of wetland vegetation may grow or be capable of growing).

The Department of Environmental Protection, as required by law, has delineated the boundaries of wetlands in the Westbrook area on aerial photographs at a scale of 1 inch equals 200 feet. Figure 2 shows the approximate location and extent of tidal wetlands in the project area. Most of the areas shown support a variety of salt marsh grasses and other vegetation and play an important part in maintaining the productivity of the estuary. However, a substantial acreage of wetlands along the coast and the two rivers had been lost prior to enactment of wetlands legislation, through dredging and filling for marinas, commercial establishments, residential and other development. The site contains a Phragmites salt-marsh where dredged material has been previously placed and there are areas of Spartina alterniflora along the edge of the river.

4.22 The Salt Meadow National Wildlife Refuge, located adjacent to the Menunketesuck River, was established in 1971. The 177 acre refuge contains slightly less than 50 acres of salt marshes along the river, and associated upland habitat of ecological interest and importance. Special regulations for 1976 issued by the Regional Director, U.S. Fish and Wildlife Service permit foot entry to the refuge during daylight hours, by advance reservation only, for the purpose of environmental education studies, hiking, and photography. Because the area has been only recently acquired, no detailed ecological or management studies have yet been performed by the Fish and Wildlife Service. The tidal marshes within and outside the refuge are significant in that they contain some of the deepest deposits of peat in the northeastern United States, up to about 33 feet in places.⁶ The protection afforded by the refuge plus the State regulatory mechanisms requiring permit procedures for any activities having potential impacts on tidal wetlands will undoubtedly have an important influence on conservation of these lands in the Patchogue River area.

4.23 Aquatic Ecology and Marine Resources. Detailed, site-specific information on the ecology of the Patchogue River is limited; however, the river is similar to many of the small coastal streams in Connecticut. Shellfish are abundant in both the Patchogue and Menunketesuck River. Oysters can be found as far as one and one-half miles upstream from the mouth of the Patchogue and a mile up the Menunketesuck. Species composition in the two rivers is essentially the same with good age class distribution, but oysters are more abundant in the latter. Hard clams and blue mussels are plentiful in the lower reaches of both rivers. However, the most extensive clam beds are found on the east side of Menunketesuck Island and in Westbrook Harbor to the west of the project area.

4.24 The tidal waters and flats of the Menunketesuck and Patchogue Rivers north of a line extending from the light at Grove Beach point to the southern extremity of Hawks Nest have been closed to the harvesting of shellfish for the past three years. The Department of Public Health in 1975 issued permits for the taking of seed oysters for transplanting purposes to five Westbrook residents.⁷ However, the local Shellfish Commission indicated that the extent of this activity is limited in the project area. According to Connecticut's Director of Aquaculture, it is conceivable that the tidewaters in the two rivers could be reopened to shellfishing once the sources of bacterial contamination are eliminated or significantly reduced.⁸

4.25 The Marine Region office of the Department of Environmental Protection has conducted some sampling of benthic organisms in the Patchogue River area. One station, located about 100 meters from shore, was a source of sample organisms for 12 months, and other samples were taken in the two rivers as far north as the Route 1 bridges. There appeared to be a good diversity of benthic species with an abundance of polychaetes and oligochaetes, and population gradation in response to changes in salinity was noted.⁹

4.26 As do most of Connecticut's coastal streams, the Patchogue and Menunketesuck Rivers both have annual spawning runs of alewives and small runs of smelt as well. The estuary serves as an important nursery area for juvenile menhaden (Brevoortia tyrannus), winter flounder (Pseudopleuroectes americanus), Atlantic mackerel (Scomber scombrus), and the young-of-the-year of other marine species. Atlantic silversides (Menidia menidiz), mummichogs (Fundulus sp.), sculpins, and juvenile flukes (Paralichthys dentatus), also inhabit the estuary.

4.27 At the mouth of the Patchogue River and in the vicinity of the Duck Island Harbor breakwaters, fluke, blackfish (Centropristis striata), and scup (Stenotomus chrysops) are all commonly occurring finfish species. Lobsters (Homarus americanus), cancer crabs (Cancer irroratus), green crabs (Carcinides maenas), blue crabs (Callinectes sapidus) and fiddler crabs (Uca sp.), are typical crustaceans inhabiting the project area. Lobsters and blue crabs are sufficiently abundant in the sound near the Patchogue River area to receive pressure from several small commercial fishermen. Lobster traps and floats are frequently observed around the breakwaters and near the Federal channel south of Hawks Nest, sometimes being placed so as to interfere with navigation. One local resident estimated the number of pots placed in this area as roughly 600 during the active lobstering season.¹⁰

4.28 The economic importance of sport fishing in all parts of the sound is great and has steadily increased while much of the commercial fishing activity has remained stable or declined. Recreational anglers highly prize striped bass (Morone saxatilis) and bluefish (Pomatomus saltatrix) while winter flounder, tautog (Tautoga onitis), scup and fluke are also popular sport fish in central Long Island Sound.

4.29 Historical and Archeological Feature. The National Park Service's National Register of Historic Places lists no historical sites for the town of Westbrook, although three buildings on Main Street, Old Saybrook are included in the register. Most of the development in the town's commercial boating district is of relatively recent origin. For the dredging operation itself, there is little likelihood that artifacts of potential archeological significance would be turned up, since the channel has been dredged to the same dimensions three times in the past.

4.30 Rare or Endangered Species. Contact was made with Mr. Paul Nickerson, U.S. Fish and Wildlife Service and Mr. Joseph J. Dowhen, University of Connecticut and it was their opinion that the proposed dredging would not impact any endangered plant or animal species. There are three proposed plant species to be added to the Federal list for endangered or threatened plants for Region 5, specifically Connecticut State. These plants are: Graves beach plum (Prunus gravesii); Spreading Globeflower (Trollius laxus) and the pogonia (Isotria sp.). The only animal listed as endangered for this particular area is the Indiana bat (Myotis sodalis). Mr. Dowhen also confirmed that least terns (Sterna albifrons) are known to nest in small numbers on Menunketesuck Island

located eastward just outside the entrance channel. Older records also exist on sightings of the piping plover (Charadrius melodus) along Hawk Nest Beach but no recent recordings have been made. Both species overlap in their habitat preference and are known to nest on dredge spoil sites.

V. Public Participation

5.00 This project is being planned by the Corps of Engineers in cooperation with Federal, State and local concerns. Coordination has included local public meetings and verbal communications and will include further meetings as well as written communications.

5.01 Before any work commences, a public notice will be issued describing the proposed plan of action. All interested persons and agencies may submit comments to the Corps for a thirty day period following the release of this notice.

5.02 Previously, an Environmental Assessment was prepared in May 1976 regarding the use of sidecast dredging of the approach channel. A recent Environmental Assessment was proposed August 1976 to covering project maintenance dredging undertaken in 1977.

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13. Westbrook Harbor Commission, letter to Chairman of the Zoning Commission dated February 26, 1974.
14. Sherk, J.A., Jr., and L.E. Cronin, "The effects of Suspended and Deposited Sediments on Estuarine Organisms: An Annotated Bibliograph of Selected References," Chesapeake Biological Laboratory, NRI Ref. No. 70-19, 61 pp.

SECTION 404(b) FACTUAL DETERMINATION
AND FINDING OF COMPLIANCE

FOR

PATCHOGUE RIVER

NAVIGATION CHANNEL IMPROVEMENT DREDGING

WESTBROOK, CONNECTICUT

SECTION 404(b) FACTUAL DETERMINATION
AND FINDING OF COMPLIANCE
FOR
PATCHOGUE RIVER
NAVIGATION CHANNEL IMPROVEMENT DREDGING
WESTBROOK, CONNECTICUT

1. References

- a. Section 404(b) of Public Law 92-500, as amended, Clean Water Act.
- b. 40 CFR Part 230 Subparts B, C, D, E, F, G and H dated 24 December 1980.
- c. EC-1105-2-104 Appendic C, dated September 1980.

2. The Proposed Plan

Improvement dredging is proposed for the Federally authorized Patchogue River channel in Westbrook, Connecticut. The recommended plan would widen the existing 75-foot wide entrance channel to 125 feet having a controlling depth of 8 feet with a one-foot overdepth. The proposed 125-foot wide channel would extend from deep water in Duck Island Roads to approximately the first bend in the existing Federal channel, a distance of about 1800 feet. The proposed dredging would yield approximately 17,500 cubic yards of sandy material.

Dredging in the Patchogue River channel would be accomplished by a hydraulic dredge. Dredging would start at the upper end of the project area in the vicinity of the confluence of the Patchogue and Menunketsuck Rivers so that the fine material can be placed under the coarser sand of the outer reach.

The dredged material would be pumped via pipeline along Grove Beach, west of the existing Federal jetty. Analysis of sediment samples from the channel show that the material is comprised predominantly of uncontaminated sand which would be suitable for beach nourishment. Spreading and final placement of the material would be a local responsibility.

3. Project Authority and Present Status

The Patchogue River navigation channel was authorized by Section 107 of the 1960 River and Harbor Act, P.L. 86-645, as amended.

Upon completion of public review, the Detailed Project Report with the Environmental Assessment and Section 404(b) Evaluation will be forwarded to the Chief of Engineers for approval and authorization. Appropriation of project funds would initiate development of plans and specifications for construction.

4. Environmental Concerns

Impacts associated with the discharge activity would not be significant. A loss of sand burrowing biota such as amphipods would occur at the disposal site. The effect would be temporary with recolonization occurring soon after disposal is completed. Odors may be noticeable for a short-time after the dredged sediments are exposed to the air.

Runoff from the disposal site would be minimal as the dredged material would be placed above the mean high water line.

Noise from dredging and disposal activities would be present only for the duration of the work. Present land use would not be altered by the proposed discharge.

The discharge material is composed predominantly of sand and shell particles and is suitable for beach nourishment. Elutriate and bulk sediment test results satisfied EPA water quality and State of Connecticut disposal criteria.

There are no known threatened or endangered species which could be affected by the project.

5. Restriction on Discharge (Section 230.10)

(a) There is no practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem and be capable of achieving the basic purpose of the proposed project. Although land disposal and open water disposal were considered during project planning, they were not considered practicable alternatives because of high costs and the need for beach restoration at Grove Beach. Local and state officials also requested that the dredged material be placed on Grove Beach. A "No Action" alternative is not, by definition, practicable since this would contribute to continued congestion and unsafe navigation through the Federal channel.

(b) The discharge activity would meet applicable State water quality standards; would not violate any applicable toxic effluent standard or prohibition under Section 307 of the Clean Water Act; would not jeopardize the continued existence of species listed as endangered or threatened under the Endangered Species Act of 1973, as amended, and would not destroy or adversely modify habitat determined to be critical under the Endangered Species Act of 1973, as amended; and would not violate any requirement imposed to protect any marine sanctuary designated under Title III of the Marine Protection Research and Sanctuaries Act of 1972.

(c) The discharge activity would not cause or contribute to significant degradation of waters of the United States.

(d) Appropriate and practicable steps would be taken to minimize any potential adverse impacts of the discharge on the aquatic ecosystem.

6. Findings of Compliance (Section 230.12)

(a) Upon review of these guidelines (Subparts C through G) the proposed disposal site for the discharge of fill material has been specified as complying with the requirements of these guidelines.

(b) A factual determination required by Section 230.11 with respect to disposal of fill material and potential environmental impacts resulting from such disposal is presented on page 6. Concomitant reading of or adequate familiarity with Section 404(b) Guidelines will insure understanding of results presented in the factual determination.

7. Conclusions

a. An ecological evaluation has been made following guidance in 40 CFR 230, Subparts B through G. Subpart H was reviewed to determine applicability to the proposed project.

b. Appropriate measures have been identified and incorporated in the proposed plan to minimize adverse impacts on the aquatic environment as a result of the discharge.

c. Consideration has been given to the need for the proposed activity, the availability of alternate sites and methods of disposal that are less damaging to the environment, and such water quality standards as are appropriate and applicable by law.

d. Dredging of the Patchogue River navigation channel would require the discharge of fill material. Impacts on the aquatic environment would be temporary and localized. The discharge material consists of clean sand which is similar to the existing composition of the sediments at Grove Beach. Dredging is necessary to provide a safe channel of adequate design to assure safe navigation through the Patchogue River channel.

Statement

The proposed disposal site for dredged material from the Patchogue River channel has been specified through the application of Section 404(b) Guidelines.

The project files and Federal regulations were reviewed to properly evaluate the objectives of Section 404(b) of Public Law 92-500, as amended. A public notice with respect to the 404 Evaluation will be issued accompanying this document. Based on information presented in this Section 404 Evaluation, I find that the project would not result in unacceptable impacts to the environment.

17 Dec '82

DATE



CARL B. SCIPLE
Colonel, Corps of Engineers
Division Engineer

FACTUAL DETERMINATION

230.11(a) Physical Substrate Determination

The proposed discharge activity would not significantly change the characteristics of substrate at the proposed discharge site. Discharge of the dredged material along Grove Beach would not significantly change its present character as the particle sizes of the discharge are compatible with those on the beach. Spreading and final placement of the material would be a local responsibility. The beach profile would be restored by summer if the project is carried out in the late fall or winter. Runoff of the discharge material into the surrounding waters would be minimal. A loss of sand burrowing biota such as amphipods would occur at the disposal site. This effect would be temporary with recolonization occurring soon after disposal is completed. The discharge material is clean sand, therefore there would be no contaminants introduced onto the disposal site. Dredging and disposal would be scheduled to avoid shellfish spawning and anadromous fish species spawning runs.

The proposed project would not involve dredge or fill activities in any wetlands.

(b) Water Circulation, Fluctuation and Salinity Determination

The discharge of 17,500 cubic yards of material would not alter current patterns, circulation, normal water fluctuation, or salinity gradients at the disposal site. Material would be placed above the mean high water line on Grove Beach. Flushing rates would not be affected by the dredging or discharge activities.

(c) Suspended Particulate/Turbidity Determination

Disposal would be on the Grove Beach shoreline above the mean high water line, therefore, runoff into the surrounding waters would be minimal. Suspended particulate and turbidity levels would temporarily increase at the dredge and disposal sites. The large grain size of the sediments would significantly reduce suspension of materials in the water column, and the particles would quickly settle out. No long-term impacts are expected. The grain size of the dredge sediments is similar to the grain size of the sediments at the disposal site.

The discharge activities would not violate such water quality standards as are appropriate and applicable by law.

(d) Contaminant Determination

The discharge material would not introduce, relocate or increase contaminants at the disposal site. Material from the Patchogue River channel consists predominantly of sand, and is ecologically acceptable for beach nourishment. Elutriate and bulk sediment test results satisfy EPA water quality and State disposal criteria.

(e) Aquatic Ecosystem and Organism Determination

Discharge activities would not significantly disrupt the chemical, physical or biological integrity of the aquatic ecosystems. The food chain would not be significantly disrupted in such a manner as to alter or decrease diversity of plant or animal species.

Discharge activities may temporarily disrupt faunal movement but are not expected to significantly interfere with movement into and out of feeding, spawning, breeding or nursery areas. Potential impacts on shellfishery resources would be mitigated by off-season construction activities to avoid the spawning season. There would not be significant changes in current patterns, salinity patterns or flushing rates which would affect shellfish. Discharge activities are not expected to interfere with reproductive processes or cause undue stress to juvenile shellfish forms.

Discharge of fill material would bury any biota inhabiting the disposal area. This effect would be temporary, with recolonization occurring soon after disposal is completed.

Discharge of the dredged material would not significantly degrade substrate, water quality or hydrological parameters as determined through application of Sections 230.11(a) and (b).

Impacts of turbidity on benthic deposit feeders, filter feeders and finfish would be temporary and localized.

A bulk sediment analysis was conducted on sediment samples collected from the channel area. The physical analysis showed that the material is composed primarily of sand. Elutriate tests showed that concentrations of all parameters fall below EPA Criteria for the Section 307(a)(1) toxic pollutants (Federal Register, Nov. 28, 1982).

Sediment disruption could allow organic material to enter the water. However, organics are not a major constituent of the sediments and impacts are expected to be minor. Tidal flushing rates in the project area are sufficient to eliminate any substantial decrease in dissolved oxygen levels which might occur from any release of organics.

(f) Proposed Disposal Site Determination

The discharge material would be used for beach nourishment and is composed predominantly of sand. It is compatible with the existing material on the proposed disposal site. Disposal on Grove Beach would be above the mean high water line, therefore, dispersion back into the surrounding waters would be minimal.

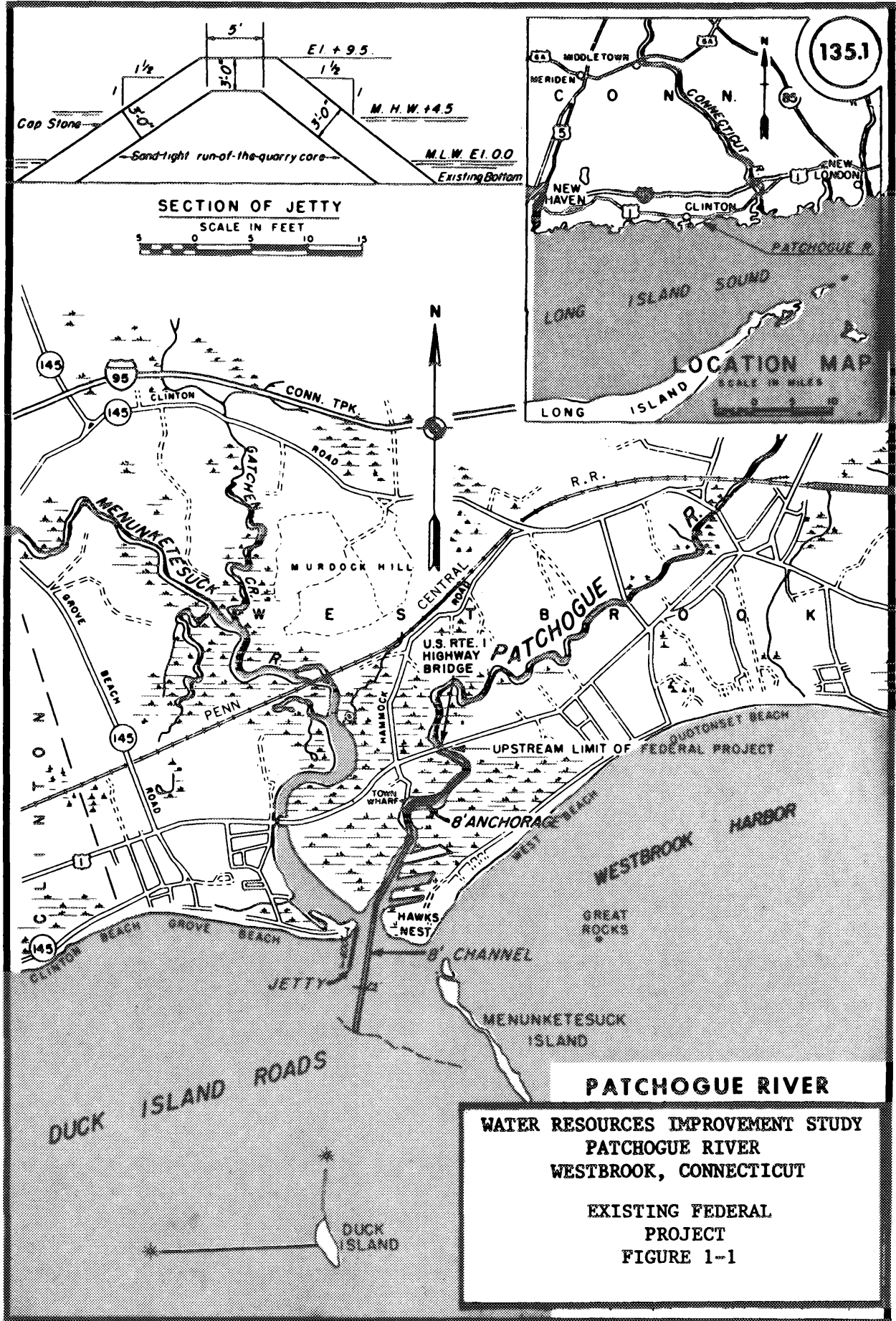
As the material is clean sand and would be placed on a beach, there would be no change in salinity patterns or effects on the mixing zone as a result of the discharge.

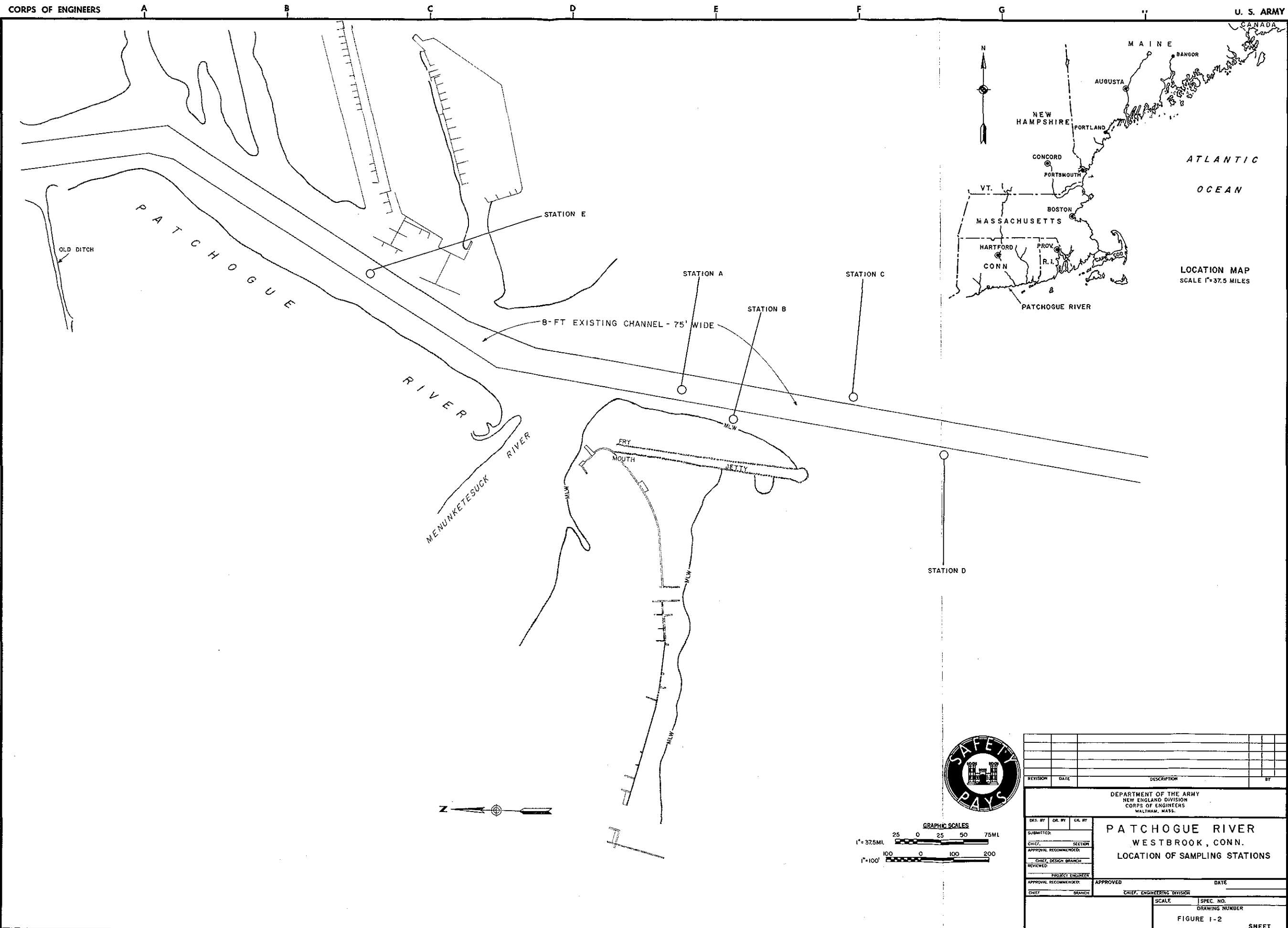
(g) Determination of Cumulative Effects on the Aquatic Ecosystem

There would be no long-term cumulative effects on the aquatic ecosystem due to the discharge activity. The clean dredged sand, once deposited on the beach, is left for reworking by storms and currents. The beach profile would be restored by summer if the project is carried out in the late fall or winter.

(h) Determination of Secondary Effects on the Aquatic Ecosystem

Disposal activities would be scheduled to avoid interference during spawning seasons to ensure no secondary impact on reproductive processes of benthic organisms. There would be a temporary loss of productivity of organisms at the disposal area which predators may use as a food source. There would be no bioaccumulation of contaminants or sporadic releases of contaminants into the water column.





PATCHOGUE RIVER
WESTBROOK, CONNECTICUT

DETAILED PROJECT REPORT

APPENDIX 2
ENGINEERING INVESTIGATION, DESIGN AND COST ESTIMATES

Prepared by
Department of the Army
Corps of Engineers
New England Division

APPENDIX 2
ENGINEERING INVESTIGATIONS, DESIGN AND COST ESTIMATES

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ENGINEERING INVESTIGATIONS, DESIGN AND COST ESTIMATES

SECTION A

INTRODUCTION

1. A number of engineering investigations were undertaken in the project area selected for detailed study. These investigations involve redesigning the existing Federal channel to accommodate additional traffic and conducting stability analyses of the existing Federal jetty to determine if increasing the channel width would impair the strength of the jetty foundation.

FIELD INVESTIGATIONS

HYDROGRAPHIC SURVEYS

2. A hydrographic condition survey of the project area was performed in June 1981. The survey results, as shown in Figure 2-1, show the plotted depths in the proposed channel modification area and provide an accurate assessment of channel bottom contours at that time.

TOPOGRAPHIC SURVEYS

3. A topographic survey of Grove Point and the proposed Grove Beach nourishment area was performed in the spring of 1982. Cross sections of the existing Federal jetty were also obtained during this survey. The survey results are shown on Figure 2-2.

SUBSURFACE INVESTIGATIONS

TOPOGRAPHY AND GEOLOGY

4. The project area is generally flat, characterized by elevations ranging between tide level and 15 feet above (NGVD) National Geodetic Vertical Datum.

5. The surficial geology is characterized by glacial till and glacial and recent deposits of sand and gravel. Marsh deposits, consisting of peat and organic silt, overlie much of the sand and gravel. Local areas have been extensively covered by artificial fill.

6. Although there are no outcrops in the area, the bedrock consists of an igneous and metamorphic sequence of granite and gneiss.

SEISMIC SURVEY

7. Introduction. Several hand probings were conducted in the area of the proposed channel widening by the New England Division prior to October 1949. Two of these probings met with shallow refusal, indicating a

potential for encountering bedrock during excavation operations. During the period of 1-2 September 1981, seismic reflection data along the lower portion of the Patchogue River was acquired. The specific objective of the survey was to determine the elevation of the bedrock surface buried beneath the sediments. This would allow calculations to be made on how much rock, if any, would have to be removed to satisfy navigation improvements being considered.

8. Results. Based on the results of the seismic survey, it appears that bedrock should not present a problem for dredging operations. As indicated on Figure 2-3, the depth to the deepest reflector, which is most likely bedrock, is in excess of 25 feet over most of the project area and well below the depth of the proposed 8-foot deep channel.

9. Two shaded areas on Figure 2-3 represent areas where a reflector was encountered above the 15-foot depth contour. These areas may represent bedrock highs, but more likely indicate interference from river bottom features such as shell beds or sediments with high organic content. If these areas are, in fact, bedrock, they would not pose any problems because they are well below the proposed 8-foot channel depth.

JETTY STABILITY

10. General. The existing jetty was analyzed by the wedge method (see Figure 2-4) for its resistance to shear failure under present conditions and following proposed channel excavation. For the first case, a shallow potential failure plane in sand at the base of the jetty was considered (Figure 2-5). For the post-excavation case, a deeper potential failure plane through an assumed clay layer intercepted by the channel excavation was considered (Figure 2-6).

11. Selection of Design Values. The design unit weights and shear strengths for the jetty and assumed foundation materials have been selected based on previous probings at the site, field reconnaissance and experience with similar materials. The various design values used in the analyses are tabulated on Table 2-1.

<u>Material</u>	TABLE 2-1 UNIT WEIGHT - PCF			<u>Shear Strength</u>
	<u>Dry</u>	<u>Sat</u>	<u>Sub</u>	
Stone Jetty	120	-	-	$\phi = 35^\circ$ C=0
Sand	100	125	61	$\phi = 30^\circ$ C=0
Clay	-	110	46	$\phi = 0^\circ$ C=300 psf

12. Results of Stability Analyses. The computed minimum factors of safety against shear failure are 1.35 for the shallow failure surface in sand and 1.97 for the deeper failure surface in clay. These factors of safety indicate that the stability of the existing jetty will not be adversely affected by the proposed channel excavation.

CHANNEL CROSS SECTIONS

13. In order to determine the quantity of material to be dredged, data derived from the hydrographic survey and subsurface investigations were used to develop cross sections of the area to be dredged under the various alternative plans. Typical cross sections are shown in Figures 2-7, 2-8 and 2-9. The location of these cross sections is shown on Figure 2-10.

NATURE OF THE MATERIAL TO BE REMOVED

14. In order to determine the physical nature of the material to be removed and its suitability as beach nourishment material, mechanical analyses were conducted on four samples taken from the project area. The locations of these samples are shown on Figure 2-11. Grain size curves developed from these samples are shown in Figures 2-12 through 2-15.

15. Physical analysis of the sediments to be dredged revealed that the material is composed of gravelly medium-fine sand and medium-fine sand and silt with a median grain size ranging from .02 mm to .21 mm. Although smaller than the existing beach sand, which has a median grain size of 0.40 - 0.50 mm, the material would be suitable for beach nourishment. A summary of this data is found on Table 2-2.

TABLE 2-2
PHYSICAL TEST RESULTS - SEDIMENT SAMPLES
PATCHOGUE RIVER, WESTBROOK, CONNECTICUT

Parameter	Surface Grab A-6P-2	Surface Grab B-GP-1	Tube 0.0-1.6' C-PF-3	Surface Grab D-GP-3
Visual Classification	Greyish Brown gravelly med. to fine SAND w/clams and shell fragments	Dark grey organic fine sandy clayey clayey SILT with shell fragments and trace of gravel	Greyish Brown silty med. to fine SAND with shell fragments	Greyish Brown med. to fine SAND with shell fragments
Grain Size-Median (mm)	0.0510	0.0200	0.1900	0.2100
Grain Size-D75	1.4000	0.0640	0.3900	0.3000
Grain Size-D25	0.0300	0.0046	0.1400	0.1800
Sorting coefficient	6.831	3.730	1.669	1.291
Normal (N) or Bimodal (B) curve	N	N	N	N
Specific Gravity	2.70	2.70	2.66	2.69
% Fines	2.5	77.5	9.0	1.0
Percent Solids		59.6		
Liquid Limit		38		
Plastic Limit		24		
Plastic Index		14		
Wet Unit Weight			117.24	
Dry Unit Weight			90.84	
% Volatile Solids - EPA		4.42		
% Volatile Solids - NED		2.85		
Natural Moisture Content			29.05	

SECTION B
CHANNEL CRITERIA

16. Factors for consideration in determining appropriate channel widths include the existence of passing situations, vessel controlability and maneuverability, vessel speed, and physical characteristics of the channel banks.

17. In selecting the optimum width for the channel, alternative widths of 100, 125 and 150 feet were analyzed (see Appendix 3). The final design width of 125 feet was selected as it provided the most operationally efficient solution.

18. The optimum depth for the Patchogue River channel is considered to be maintaining the existing 8 foot deep channel, based on a design vessel 35 feet long drawing up to 6 feet of water and having a beam of 11 feet. Since the narrow widths of the Patchogue and Menunketesuck River preclude their use by large sailboats, this depth is considered to be the optimum for the power and sail vessels using and projected to use this harbor.

19. Plans A, B and C share the same alignment of the existing channel but vary only in the amount that they increase the width of the existing channel.

SECTION C
QUANTITY ESTIMATES

Quantities of Material to be Removed

20. Estimates of material to be removed are based on hydrographic surveys of the existing river bottom and portions of Long Island Sound in the project area (Figure 2-1), hand probings, and seismic surveys.

21. The dredged quantities were determined by using data from the above mentioned investigations to develop several cross-sections of the project. The average cross-sectional area and distance between sections were multiplied to determine the volume in each section. These computations include a 1-foot overdredge allowance in areas where a sandy, mud and gravel bottom exists. No evidence of rock was found in the project area above the proposed project depths.

22. The length of channel section to be increased in width was estimated to be 1800 feet which is the distance from the beginning of the channel to the confluence of the Patchogue and Menunketesuck Rivers. The optimum depth was calculated to be 8 feet MLW based on a design vessel being a cruising sailboat with a length of 35 feet drawing 6 feet of water. The side slopes of the channel will remain at the present 1:3 ratio to provide suitable stability.

23. The largest concentration of material to be removed, based on the June 1981 condition survey, is in the area of the Federal jetty with smaller volumes in the outer reach of the channel.

24. The estimated amount of ordinary material to be removed under each of the three alternatives is given in Table 2-3.

TABLE 2-3			
Quantities of Material to be Removed			
PLAN	Length of Modification (ft)	Channel Width (ft)	Ordinary Material YD ³
A	1800	100	10,000
B	1800	125	17,500
C	1800	150	25,000

25. The following section deals with the development of the first cost of construction for the evaluated alternatives.

SECTION D
COST ESTIMATES

26. Dredging and other construction cost estimates have been developed from quantity estimates previously presented and recent construction costs prevailing in the area. All quantity estimates include an allowance for 1 foot of overdredge. A summary of dredge quantities used for cost estimates for each alternative is presented in Table 2-3.

27. Dredging costs are based on using the dredged material for beach nourishment at Grove Beach, located directly adjacent to the existing Federal jetty. Detailed information pertaining to the disposal site is located in Appendix 1. The cost estimates include monies for contingencies, supervision, administration, engineering and design. All costs are based on May 1982 price levels. Cost estimates for Plans A, B and C are presented in the following tables.

TABLE 2-4

Plan A - First Cost of Construction

Dredging: 10,000 cy of

ordinary material at \$9.00/cy	\$ 90,000
Contingencies (20%)	<u>\$ 18,000</u>
Subtotal	\$108,000
Engineering & Design	\$ 13,900
Supervision & Administration	\$ 15,000
Aids to Navigation	<u>\$ 1,100</u>
Total First Cost	\$138,000

TABLE 2-5

Plan B - First Cost of Construction

Dredging: 17,500 cy

of ordinary material at \$6.80/cy	\$119,000
Contingencies (20%)	<u>\$ 23,800</u>
Subtotal	\$142,800
Engineering & Design	\$ 20,000
Supervision & Administration	\$ 20,100
Aids to Navigation	<u>\$ 1,100</u>
Total First Cost	\$184,000

TABLE 2-6

Plan C - First Cost of Construction

Dredging: 25,000 cy

of ordinary material at \$6.00/cy	\$150,000
Contingencies (20%)	<u>\$ 30,000</u>
Subtotal	\$180,000
Engineering & Design	\$ 21,700
Supervision & Administration	\$ 22,200
Aids to Navigation	<u>\$ 1,100</u>
Total First Cost	\$225,000

SECTION E

ANNUAL CHARGES AND PROJECT MAINTENANCE

28. Maintenance of the enlarged Federal project in the Patchogue River would entail periodic dredging of the channel. In addition, navigational aids would have to be repaired or replaced on an as needed basis.

29. Following initial dredging, areas along the project perimeter which are composed of ordinary material would undergo a natural stabilization process and some of the material would slough off into the channel. In addition, material churned up from the adjacent bottom by wave or current action would also contribute to shoaling in the project area.

30. Side slopes in areas of soft bottom would be constructed with a slope of 1:3. Side slopes in the improvement area would be constructed in such a way as to provide for long-term stability, although changes to the bottom would occur over time resulting in a gradual flattening of the slopes. Strong wave or current action during storms may result in the movement of unconsolidated bottom material in the project area. The propeller wash and waves produced by passing vessels would also tend to disturb the harbor and channel bottom, resulting in redistribution of bottom sediments.

31. Annual charges for the navigation improvement project have been computed on the basis of a 50-year project life and a directed Federal interest and amortization rate for civil works projects of 7-5/8 percent. Maintenance costs are based on an average annual shoaling rate of approximately 0.4 feet per year based on maintenance experience with the existing project. Annual costs for the aids to navigation are based on consultation with the U.S. Coast Guard. Table 2-7 gives a detailed breakdown of the annual costs for each of the alternative plans.

TABLE 2-7
ANNUAL COSTS

PLAN A	
Interest & Amortization (7 5/8%)	\$ 10,800
Maintenance Dredging (600/cy @ \$8.00/cy)	\$ 4,800
Aids to Navigation	\$ 500
Total Annual Cost	\$ 16,100
PLAN B	
Interest & Amortization (7 5/8%)	\$ 14,400
Maintenance Dredging (1,200/cy @ \$8.00/cy)	\$ 9,600
Aids to Navigation	\$ 500
Total Annual Cost	\$ 24,500

PLAN C

Interest & Amortization (7 5/8%)	\$ 17,600
Maintenance Dredging (1,800/cy @ \$8.00/cy)	\$ 14,400
Aids to Navigation	\$ 500
Total Annual Cost	<u>\$ 32,500</u>

SECTION F

DISPOSAL OF DREDGED MATERIAL

32. Five sites were investigated as possible locations for disposal of dredged material. Two sites were open water sites and the remaining three were land based sites. The first alternative, an ocean dumpsite, is the New Haven Dumping Grounds located in Central Long Island Sound about 6 nautical miles south of the entrance to New Haven Harbor. A second ocean site is located at Cornfield Shoals approximately 15-16 nautical miles southeast of Westbrook. A third site is an existing diked land area extending over 9.5 acres of an 11-acre disposal area located at the confluence of the Patchogue and Menunketesuck Rivers. A fourth site is Menunketesuck Island, located to the east of the existing channel. The fifth, and recommended site, is Grove Beach, located directly to the west of the existing Federal channel and jetty. Additional information about the disposal alternatives may be found in the Environmental Assessment.

33. The cost of transporting the dredged material to either of the open water sites was determined to be significantly greater than that of using a hydraulic dredge to deposit the material on a nearby land site. The material to be dredged was shown to be primarily composed of clean medium-fine grained sand and fine grained silty sand determined to be ecologically acceptable for beach nourishment. Using this material for nourishing Grove Beach is the option preferred by local and State interests. It is also the least costly land disposal option. The choice of beach nourishment site also avoids the possibility of adverse environmental impacts associated with open water disposal. The location of the alternative open water disposal sites is shown on Figure 2-16, and alternative land sites on Figure 2-17.

34. Material to be dredged from the proposed channel area will be deposited along Grove Beach beginning at a point adjacent to the Federal jetty and extending to the west for a distance of approximately 1000 ft. Grove Beach has been subjected to continued erosion problems endangering shorefront properties and detracting from the aesthetics of the area.

35. For a more detailed analysis of the impacts of dredging and disposal of dredged material see the environmental assessment located in Appendix 1.

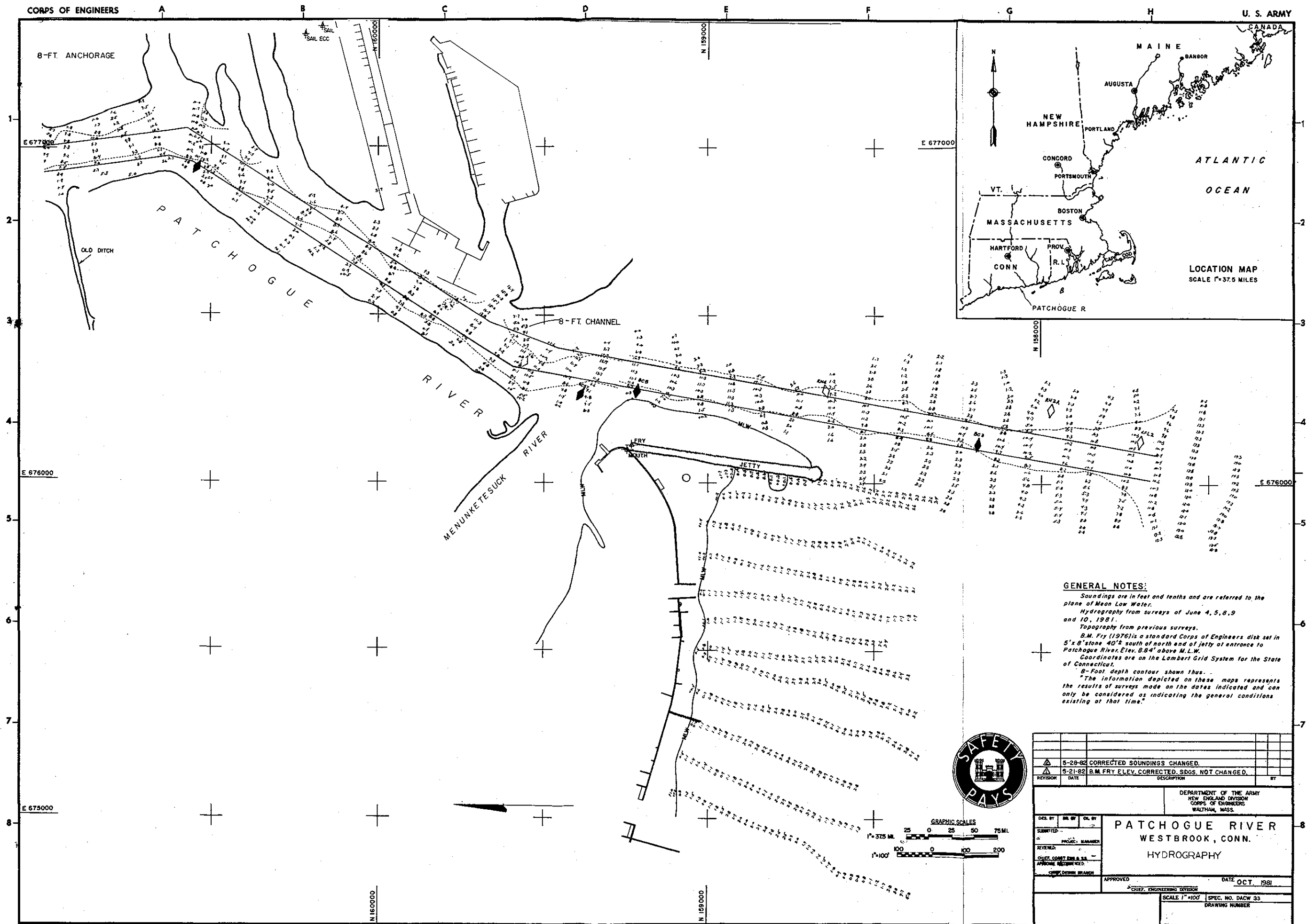
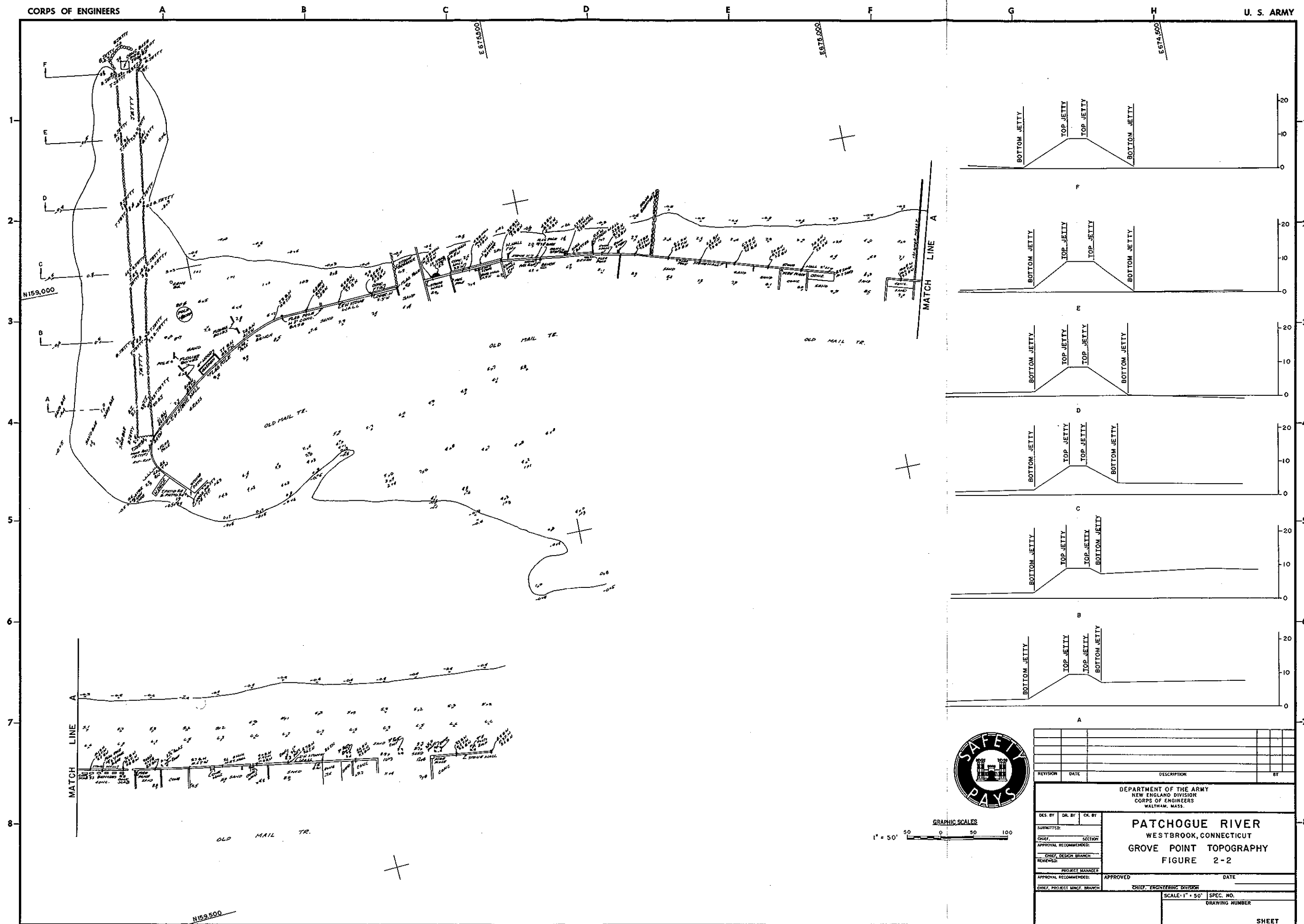


FIGURE 2-1



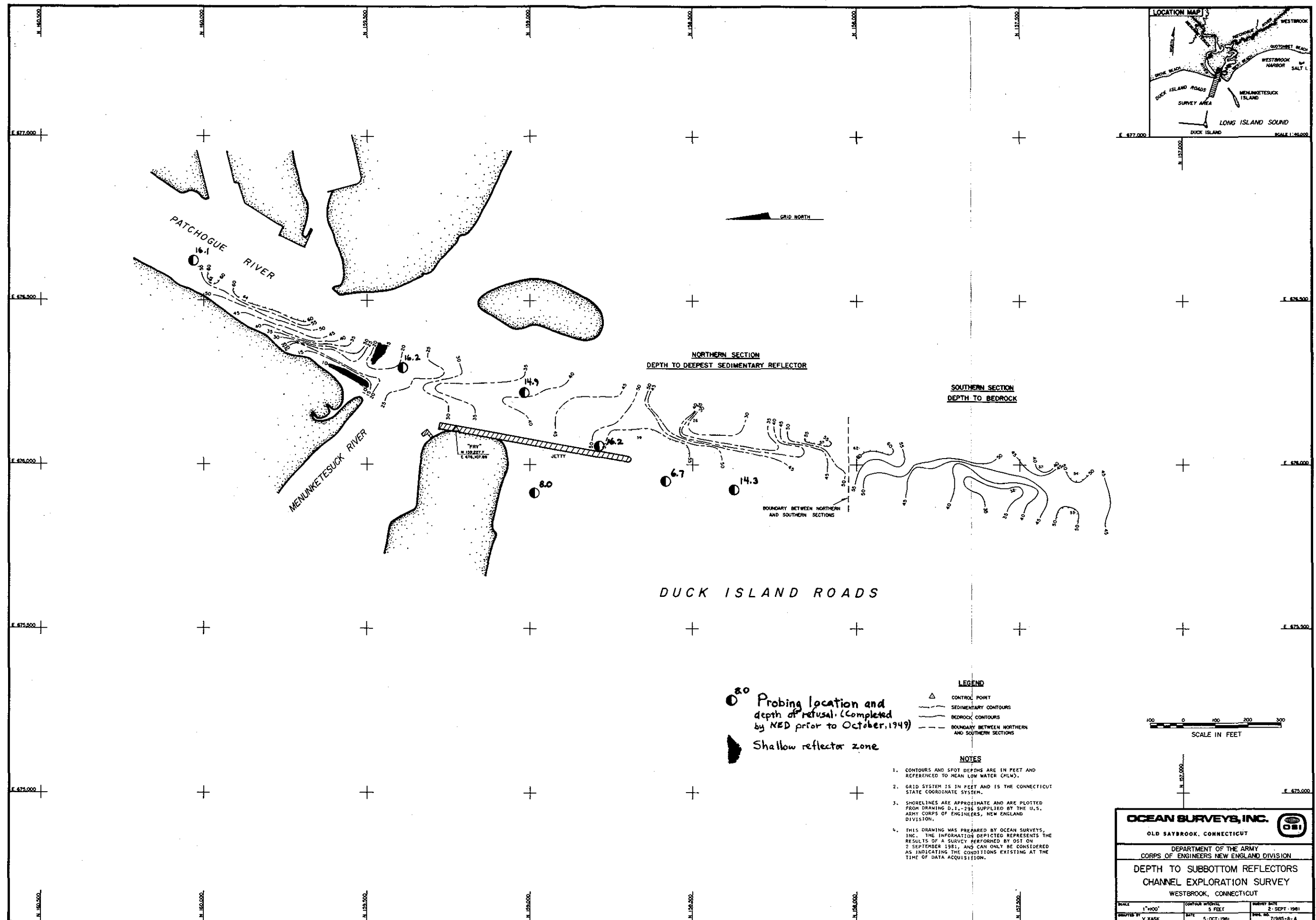
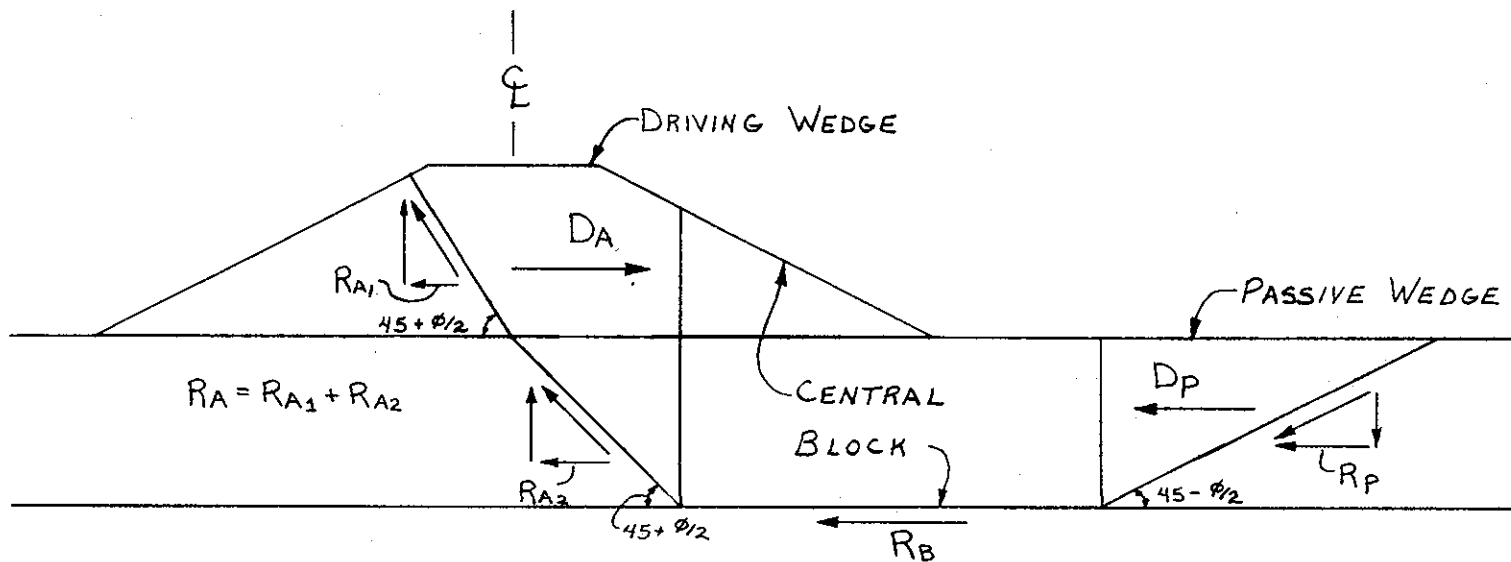


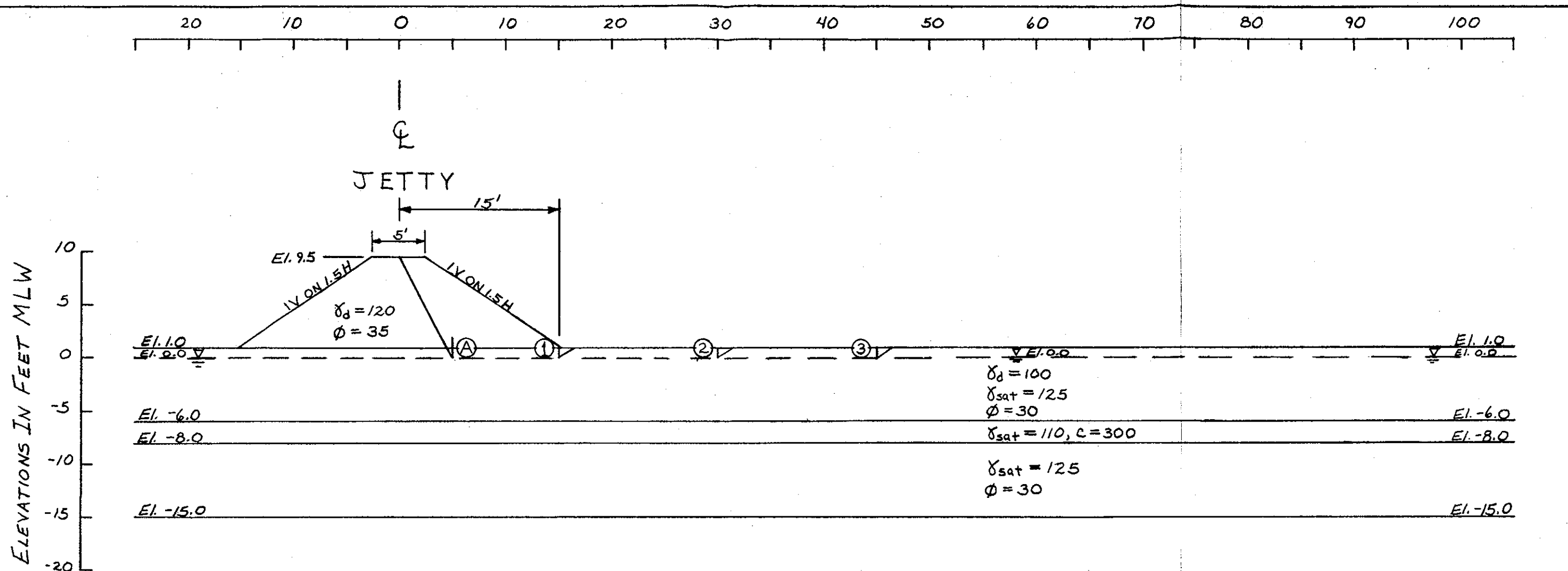
FIGURE 2-3



$$\text{FACTOR of SAFETY} = \frac{RA + RB + RP}{DA - DP}$$

DEPARTMENT OF THE ARMY NEW ENGLAND DIVISION CORPS OF ENGINEERS WALTHAM, MASS.	
DES. BY <u>JAB</u>	WEDGE METHOD OF STABILITY ANALYSIS
DR. BY <u>JAB</u>	
CK. BY <u>HAB</u>	
GEOTECH. ENG. BR. SCALE: N.T.S.	
SK. NO. 2 DATE: 2 Nov 1981	

FIGURE 2-4

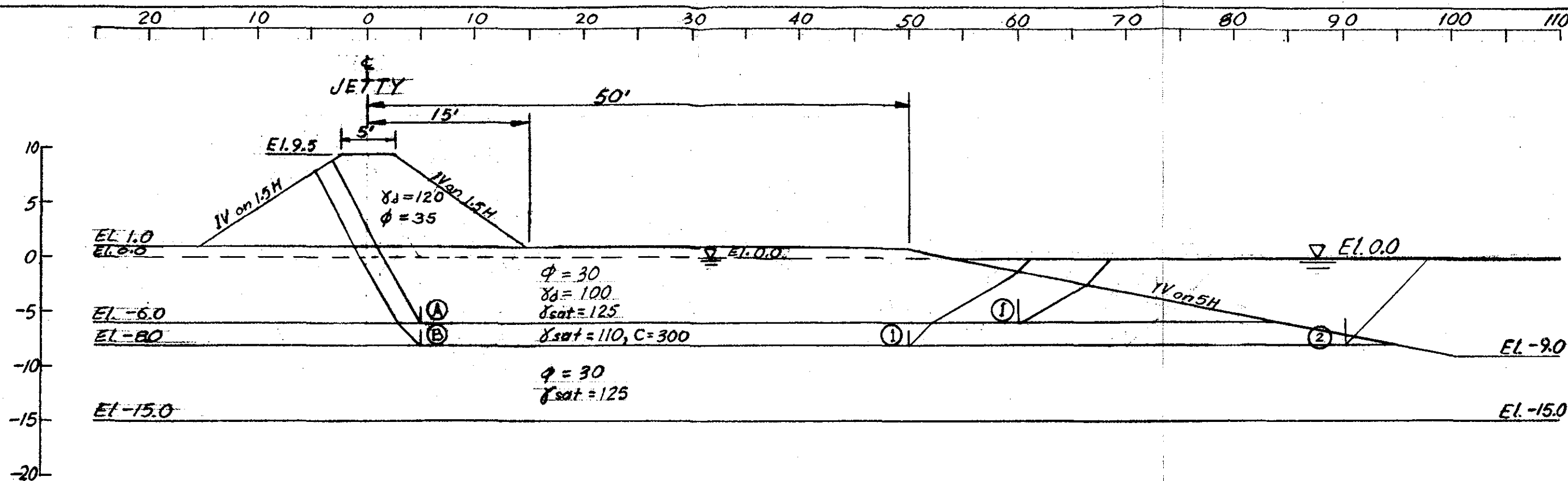


ASSUMED FAILURE SURFACE NO.	EL.	RESISTING FORCES			DRIVING FORCES		FACTOR of SAFETY
		R_A	R_B	R_P	D_A	D_P	
A1	0	3538	2931	100	4929	50	1.35
A2	0	3538	3797	100	4929	50	1.52
A3	0	3538	4662	100	4929	50	1.70

DEPARTMENT OF THE ARMY NEW ENGLAND DIVISION CORPS OF ENGINEERS WALTHAM, MASS.	
DES. BY <i>JAB</i>	PATCHOGUE RIVER
DR. BY <i>JAB</i>	CHANNEL WIDENING
CK. BY <i>KAB</i>	JETTY STABILITY
	EXISTING CONDITIONS
	WESTBROOK CT
GEOTECH. ENG. BR.	SCALE: 1" = 10'
SK. NO. 3	DATE: 2 Nov 1981

FIGURE 2-5

ELEVATION IN FEET M.L.W.

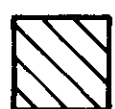
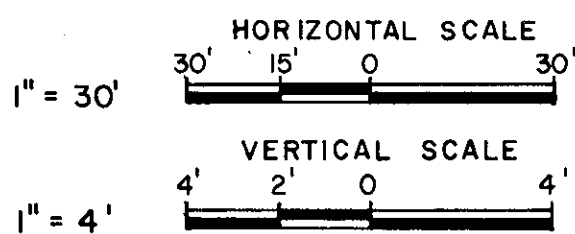
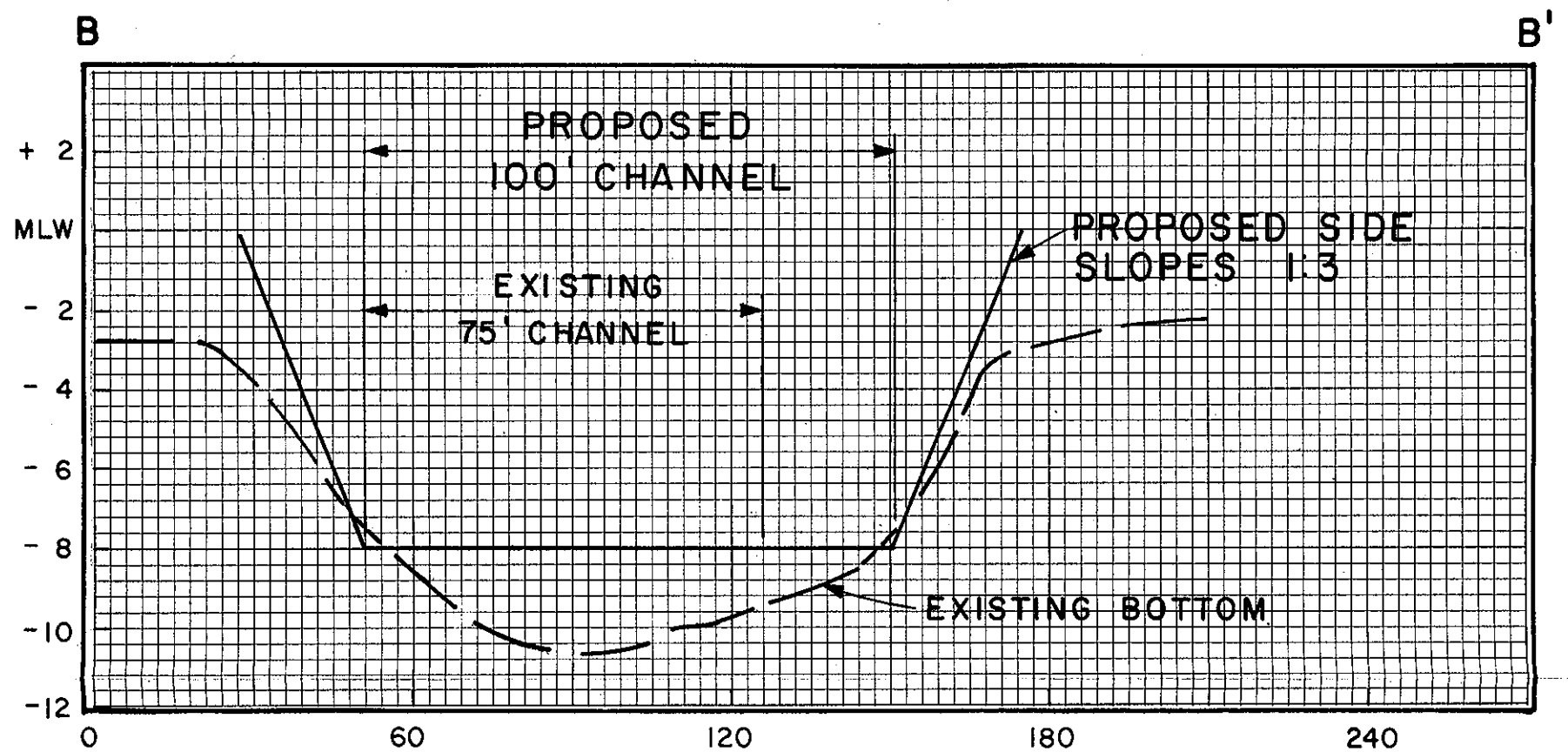
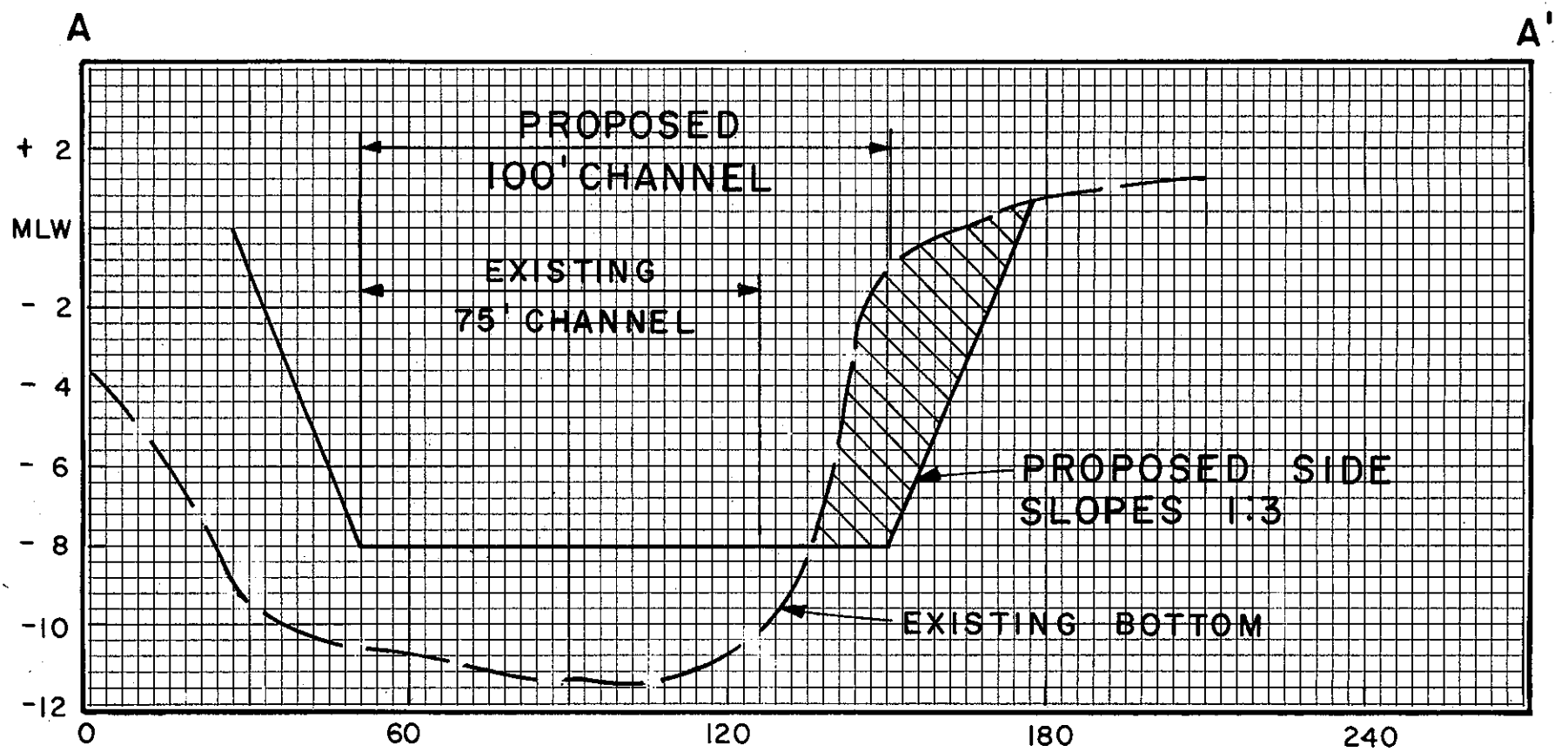


ASSUMED FAILURE SURFACE	NO.	EL.	RESISTING FORCES			DRIVING FORCES		FACTOR OF SAFETY
			R_A	R_B	R_P	D_A	D_P	
(A) (1)	-6		8765	14811	1180	13873	1720	2.04
(B) (1)	-8		9918	13500	3266	17558	4038	1.97
(B) (2)	-8		9918	20181	499	17558	2073	1.98

DEPARTMENT OF THE ARMY NEW ENGLAND DIVISION CORPS OF ENGINEERS WALTHAM, MASS.	
DES. BY <i>JLB</i>	PATCHOGUE RIVER
DR. BY <i>LW</i>	CHANNEL WIDENING
CK. BY <i>R/K</i>	JETTY STABILITY
	WITH PROPOSED CHANNEL
	WESTBROOK CT
GEOTECH. ENG. BR.	SCALE: 1" = 10'
SK. NO. 4	DATE: 29 SEPT 1981

FIGURE 2-6

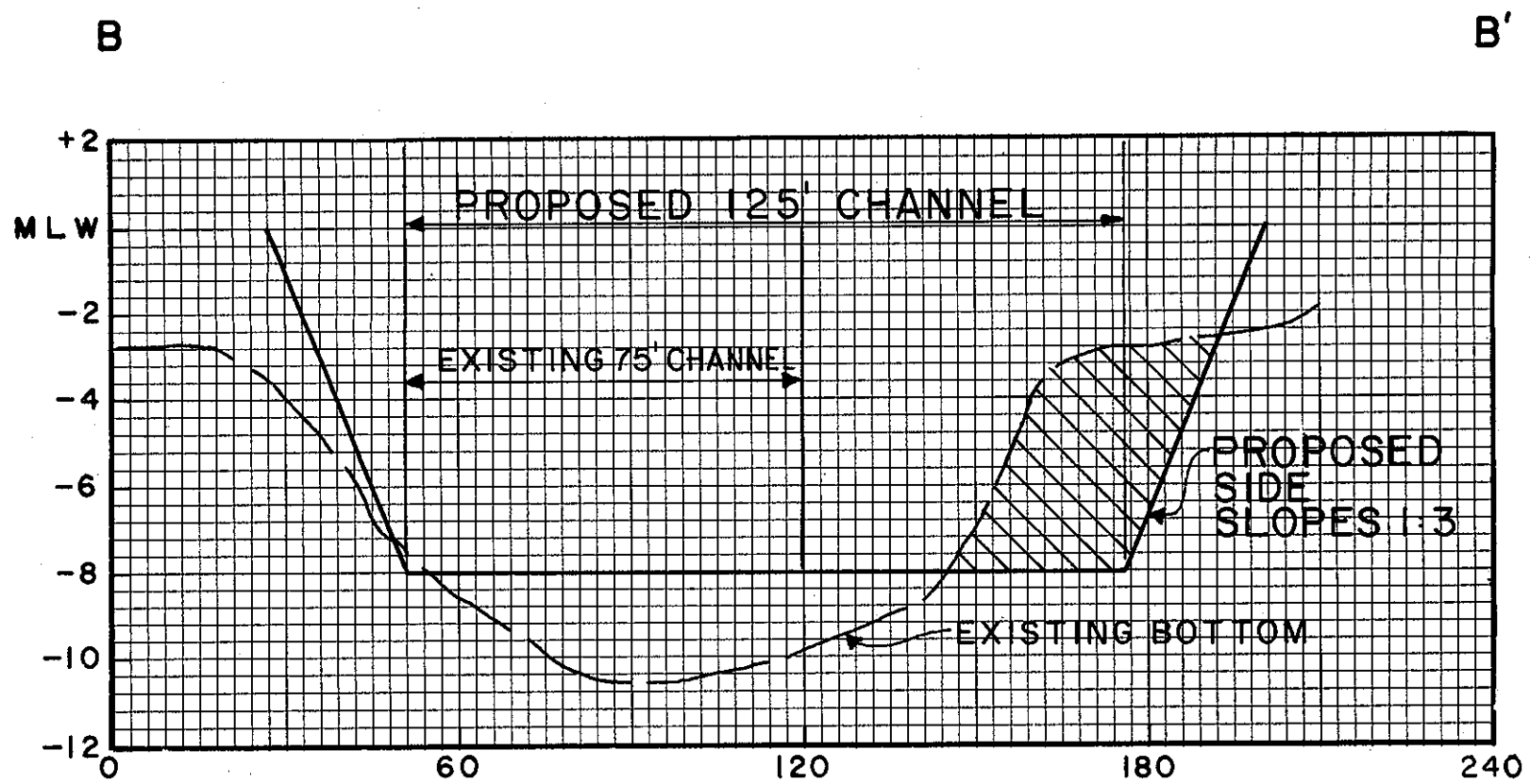
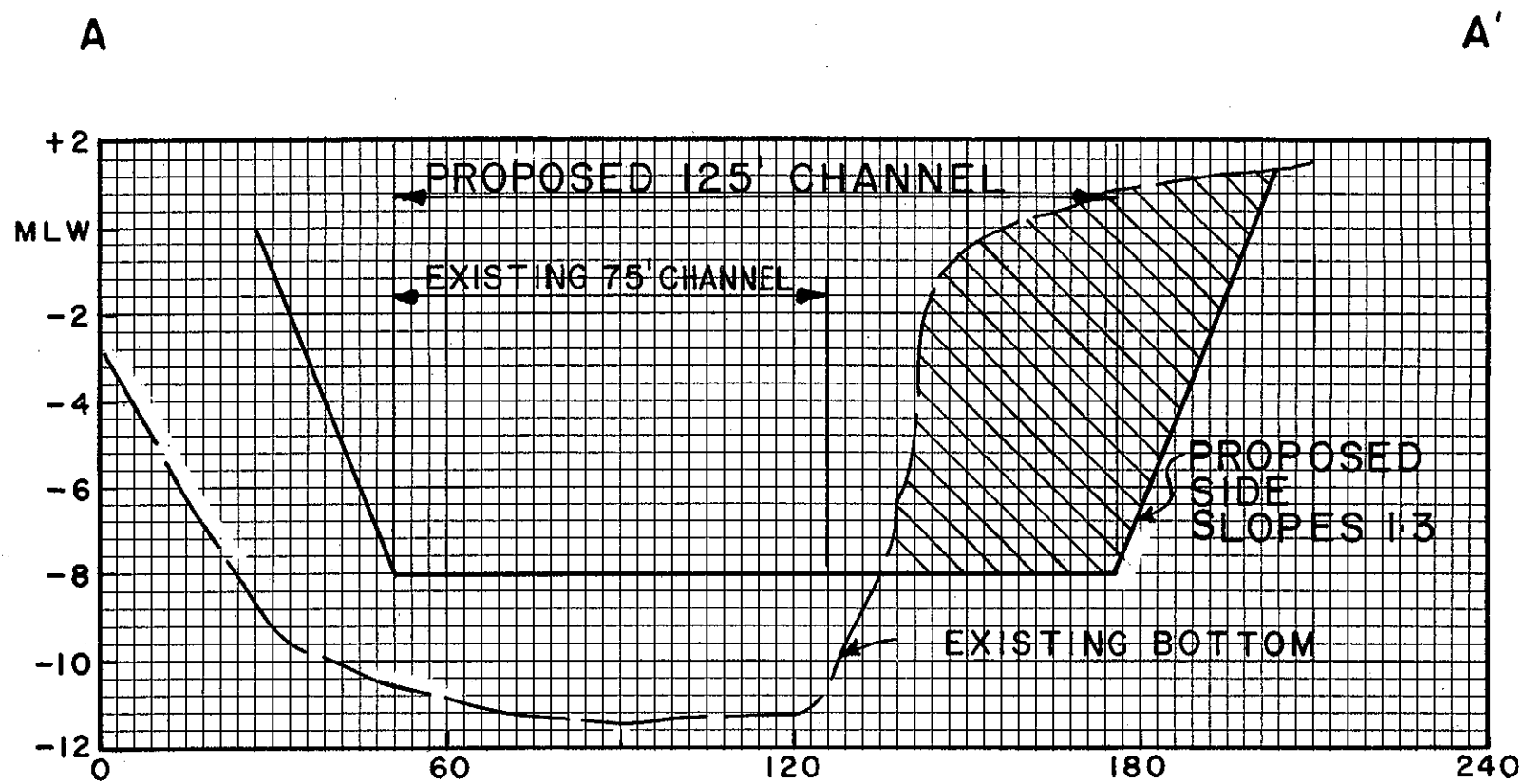
TYPICAL CROSS SECTIONS PLAN A



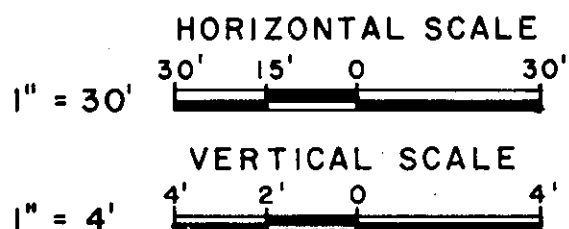
SEDIMENTS TO
BE DREDGED

PATCHOGUE RIVER
WESTBROOK CONNECTICUT
TYPICAL CROSS SECTIONS
PLAN A
FIGURE 2-7

TYPICAL CROSS SECTIONS PLAN B

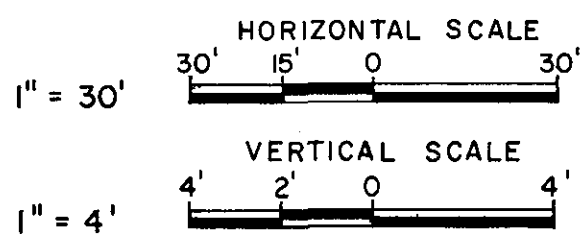
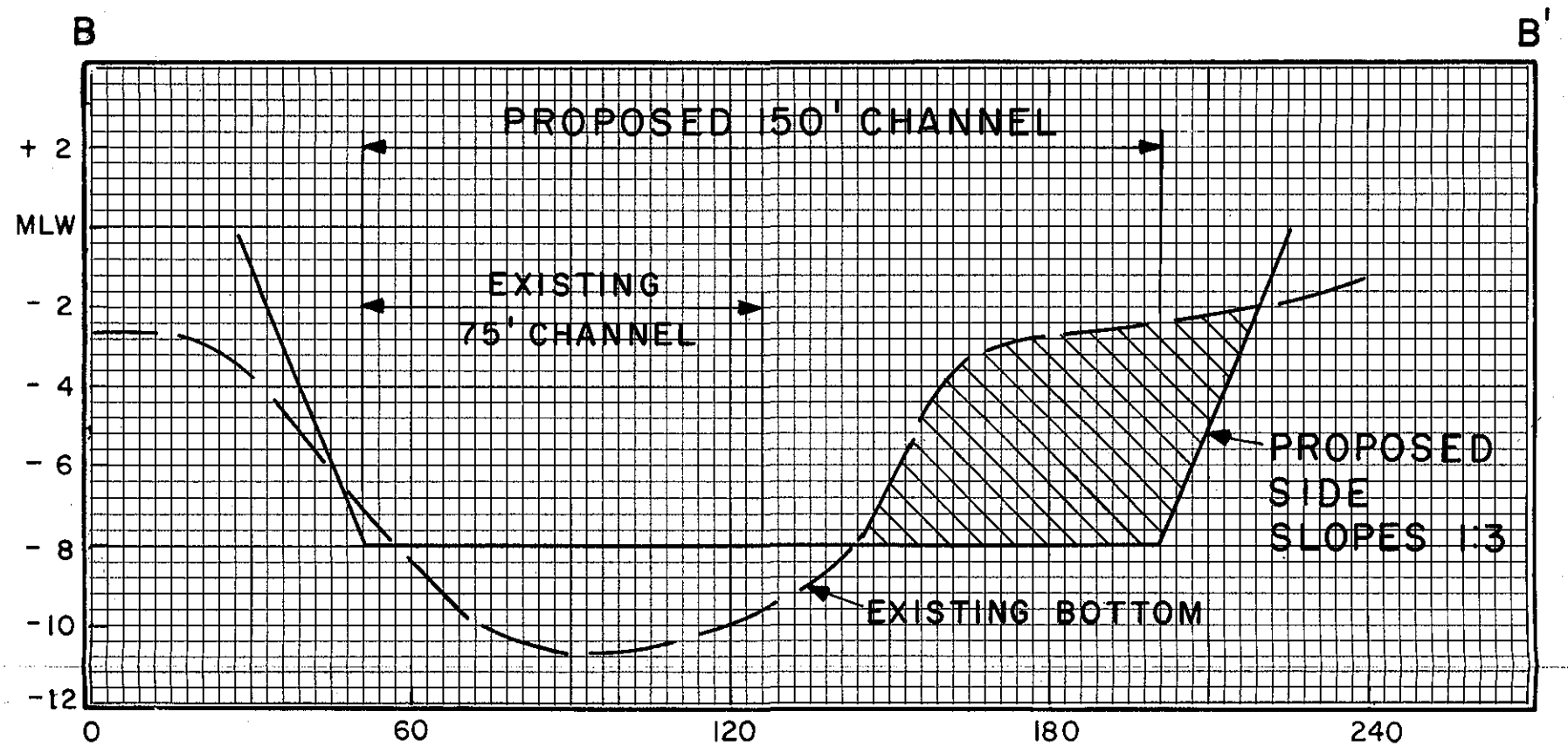
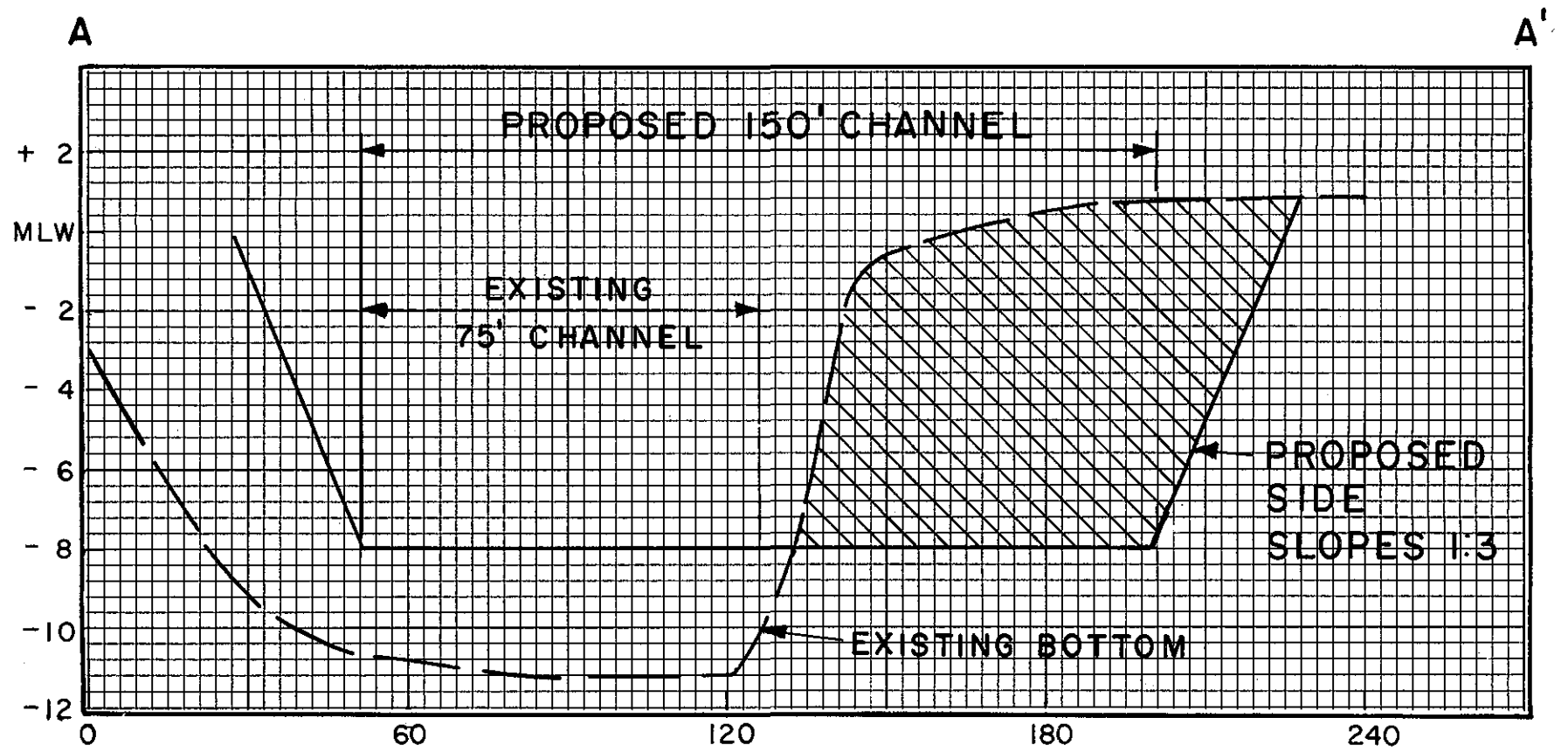


SEDIMENTS TO
BE DREDGED



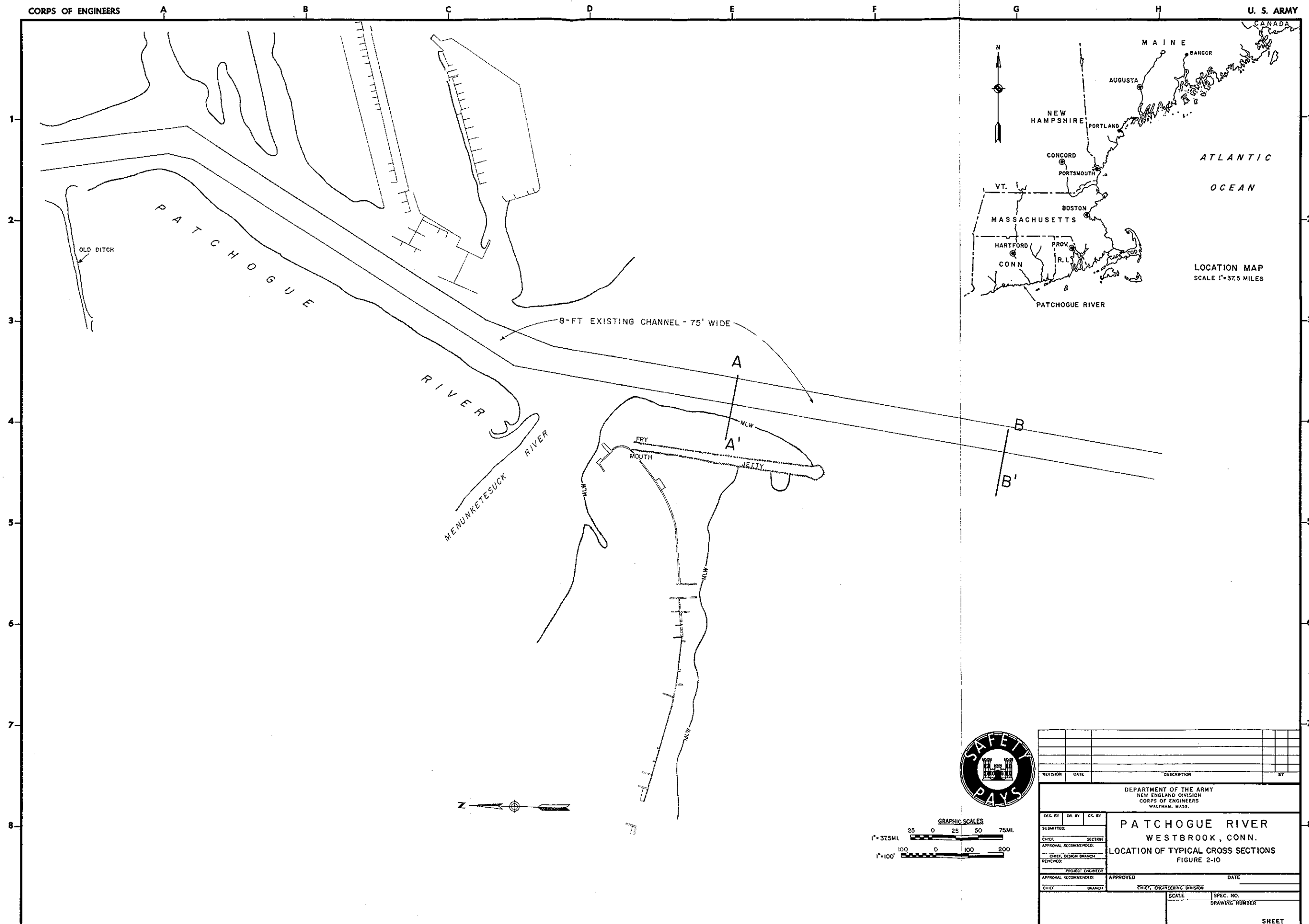
PATCHOGUE RIVER
WESTBROOK CONNECTICUT
TYPICAL CROSS SECTIONS
PLAN B
FIGURE 2-8

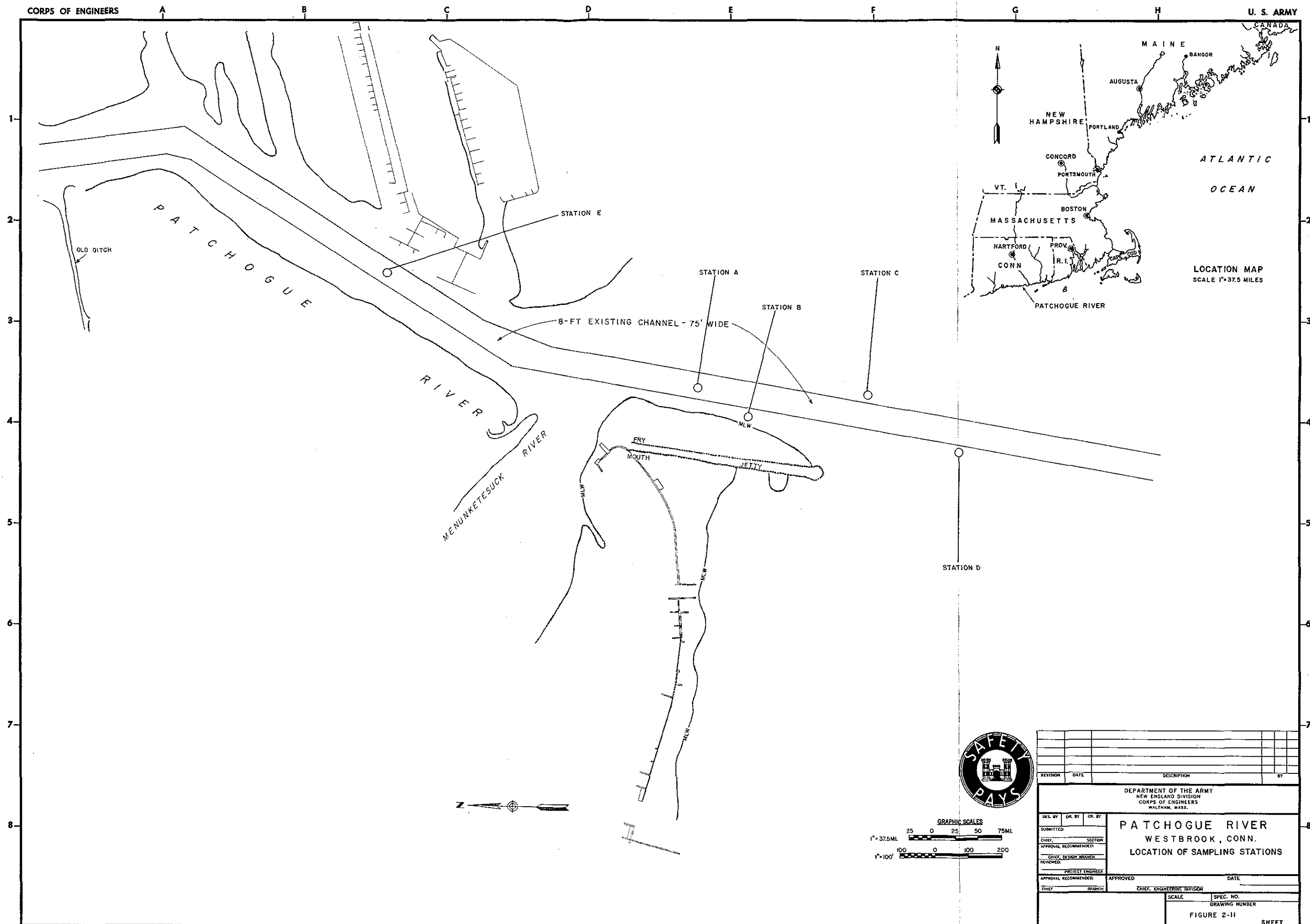
TYPICAL CROSS SECTIONS PLAN C

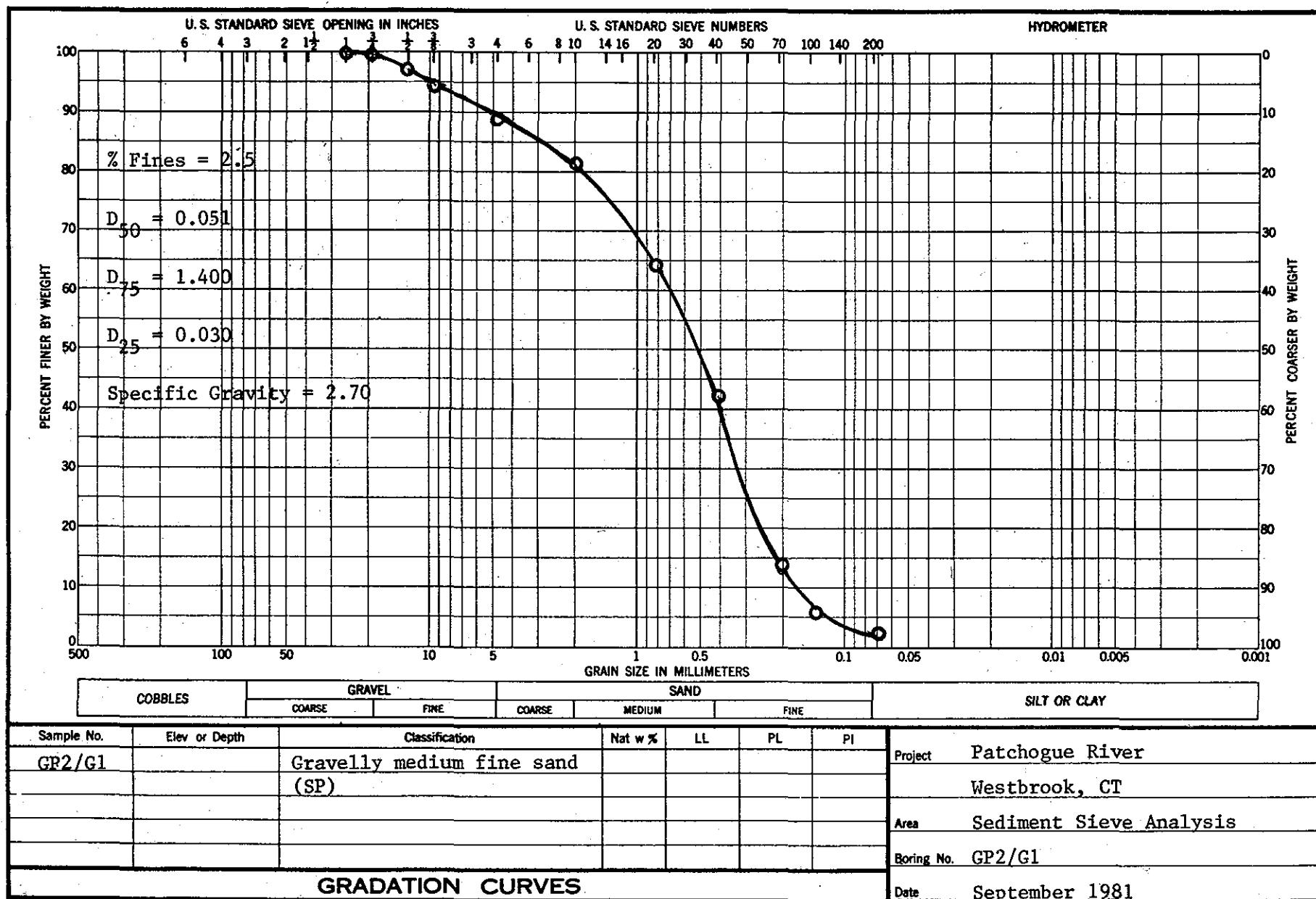


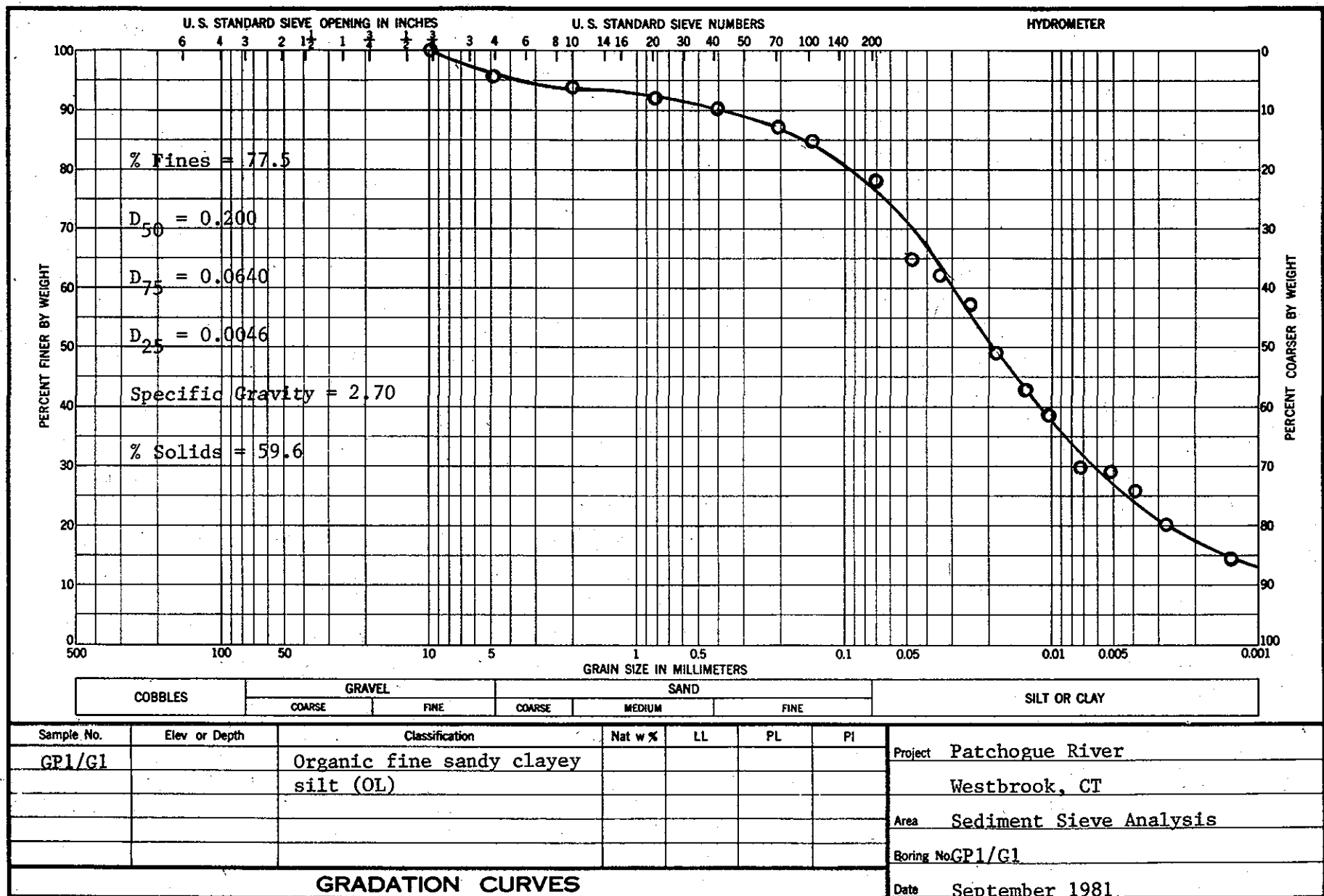
SEDIMENTS TO
BE DREDGED

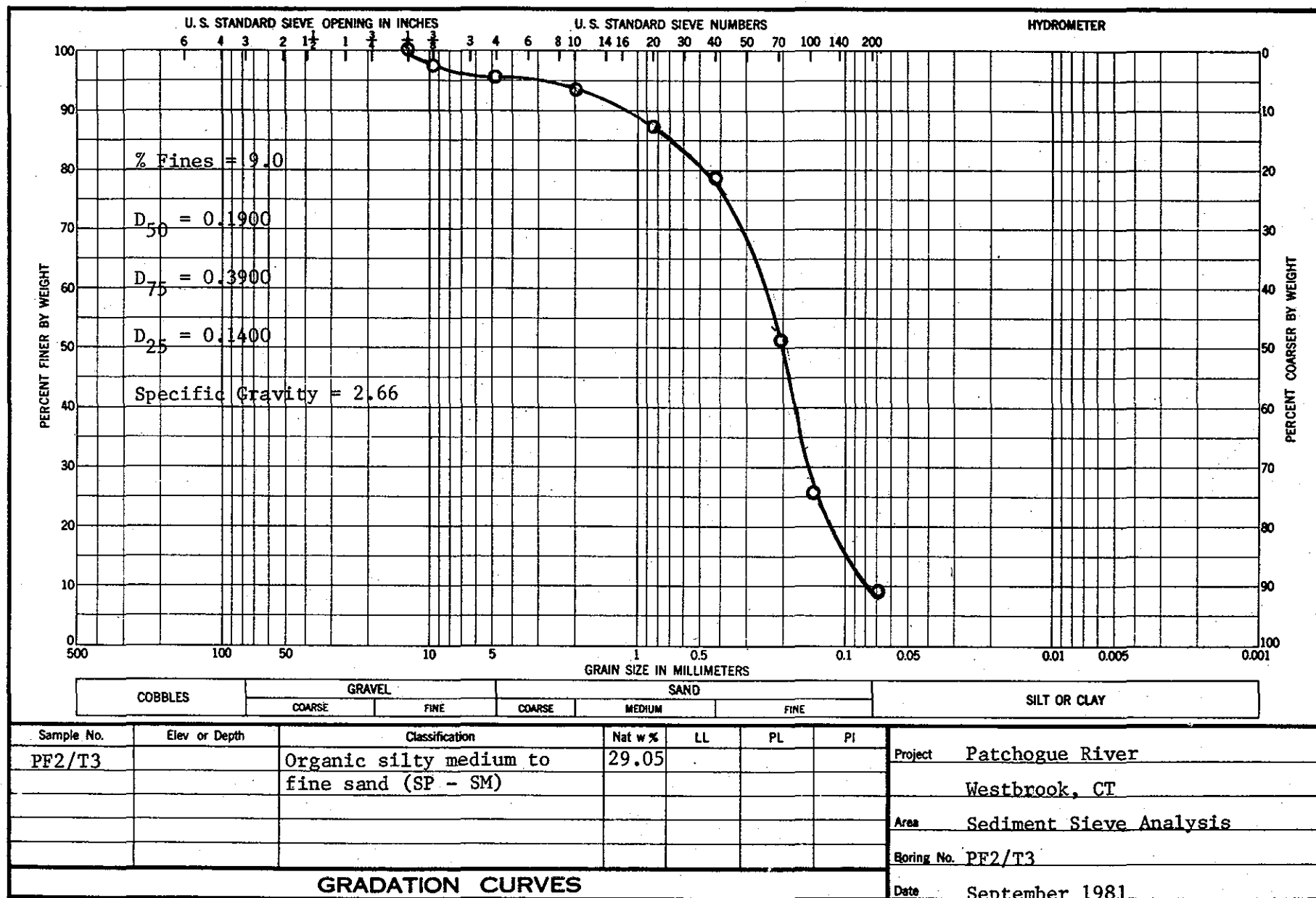
PATCHOGUE RIVER
WESTBROOK CONNECTICUT
TYPICAL CROSS SECTIONS
PLAN C
FIGURE 2-9

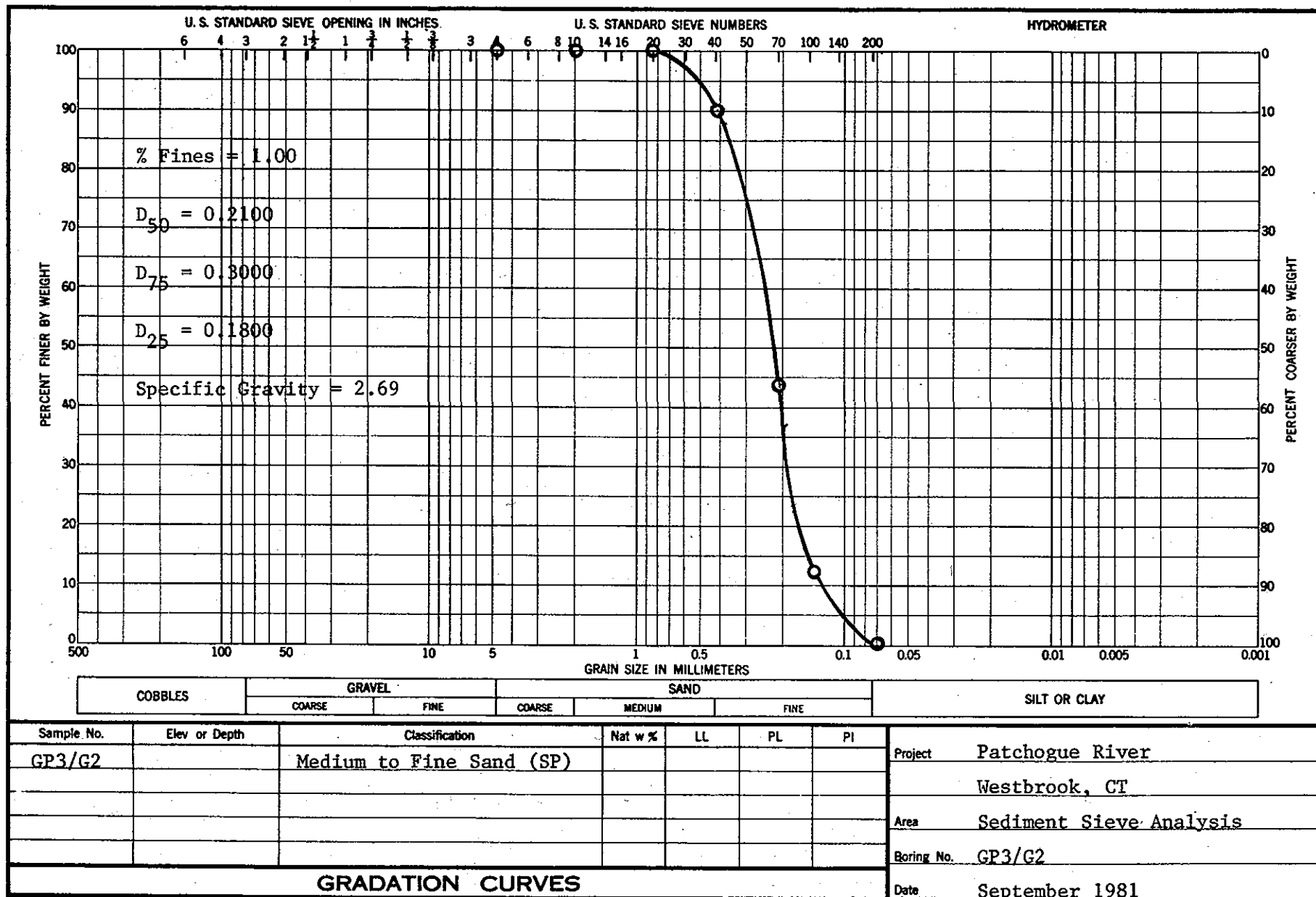


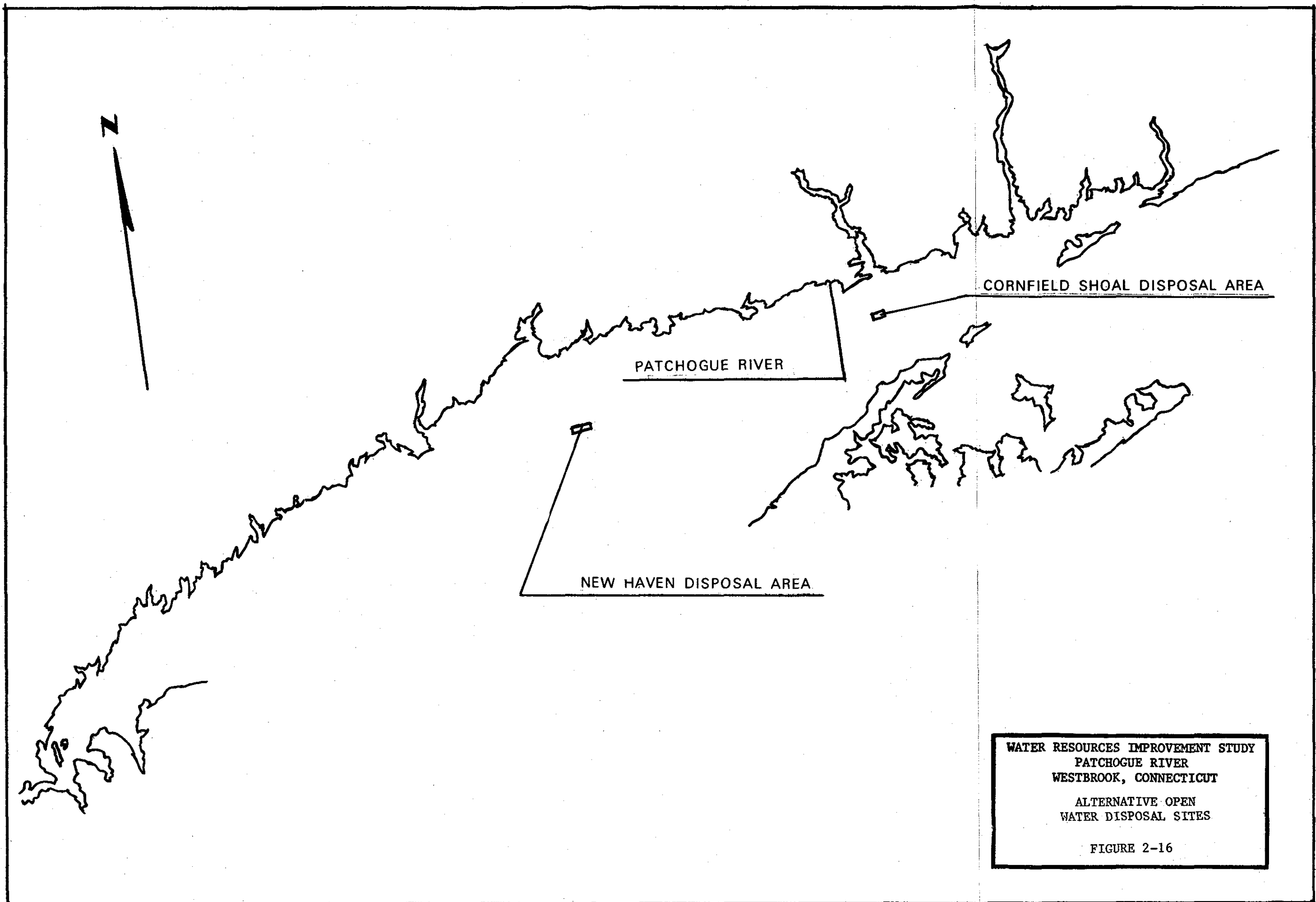


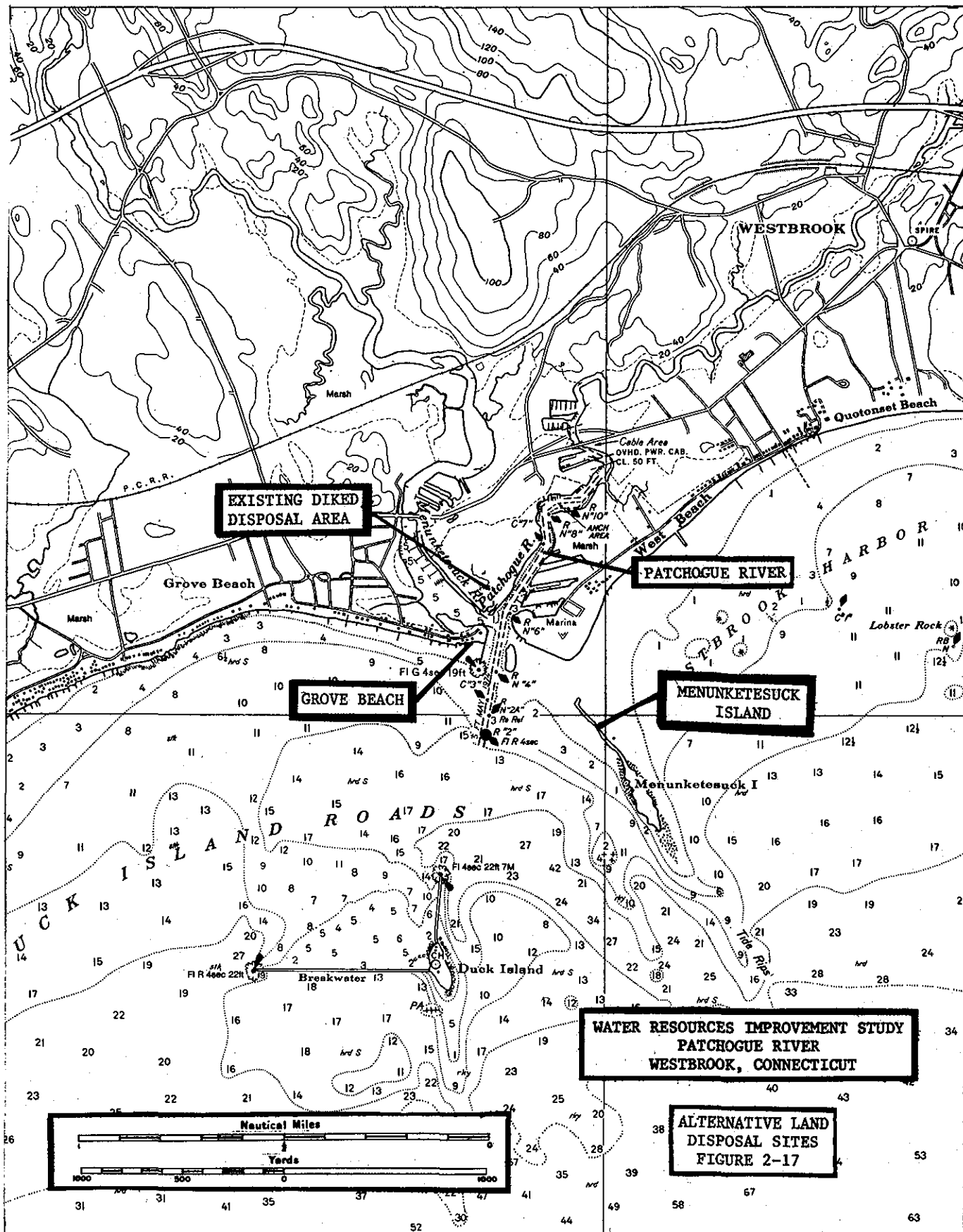












PATCHOGUE RIVER
WESTBROOK, CONNECTICUT

DETAILED PROJECT REPORT

APPENDIX 3
ECONOMIC ANALYSIS

Prepared by
Department of the Army
Corps of Engineers
New England Division

ECONOMIC ANALYSIS
PATCHOGUE RIVER, WESTBROOK, CONNECTICUT

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PATCHOGUE RIVER ECONOMIC ANALYSIS

The purpose of this appendix is to estimate the dollar value of economic benefits that would accrue to each plan. The economic feasibility of each plan was determined by comparing the annual benefits and annual costs of each plan. A plan is considered economically feasible if it has a benefit/cost ratio of 1.0 or greater.

Existing Condition

The major cause of navigational problems and delays in the study area is the inadequate width of the channel which runs from the confluence of the Patchogue and Menunketesuck Rivers for about 1,800 feet to deep water in Long Island Sound. The channel is 8 feet deep, which is adequate for the existing recreational and commercial fishing fleets. The existing width of 75 feet allows for two lanes of one-way traffic.

The recreational fleet in Westbrook, Connecticut numbers approximately 1,800 vessels with the majority of boats being power cruisers 30 to 50 feet long and cruising sailboats 20 to 40+ feet long. The fleet is almost evenly divided between marinas located on the two rivers.

The commercial fishing fleet in Westbrook is comprised of 21 vessels. The predominant species harvested are lobsters and groundfish. The vessels range in length from 15 to 45 feet and in draft from 1 foot to 5 feet. The typical vessel is a 30 footer with a 4 foot loaded draft.

The major problems which results from the inadequate channel width are delays when attempting to enter the channel from both the Westbrook and Long Island Sound ends. The congestion that results from large numbers of vessels attempting to use the channel at the same time is manifested in the form of delays which cause lost recreation time and add to the operating costs of the fishing boats. Navigational difficulties in the channel cause frequent groundings of vessels which can cause a standstill of traffic and increase collision potential. A worst case scenario would be a grounding and blocking of the channel during storm conditions which would prevent hundreds of returning Westbrook based boats from taking refuge. They would be forced to ride out the storm in Long Island Sound or travel to another harbor under dangerous conditions.

Economic Analysis - Recreational Fleet

Methodology

The "small boat formula" (EM 1120-2-113) has been rescinded as an acceptable method of computing recreational boating benefits. Also, paragraph 713.903 of the WRC Manual states, "Payment for equipment,.....", associated with recreation activity are not to be used as direct estimates of willingness to pay, because these payments are not specifically for

site use. Therefore, the increase in the net return to the fleet with the project will not be taken as the measure of benefits that accrue to recreational boating harbor improvements.

The three methods available for benefit estimation are found in sub-part K of the WRC Manual and are: the travel-cost method, contingent value method and the unit-day value (capacity) method. The unit day value method was chosen over the other two methods which were excluded for the following reasons. The travel cost method has the basic premise that per capita use of a recreation site will decrease as out-of-pocket and time costs traveling to the site increase, other variables being constant. Field research has shown that the type of specialized recreation and the profile of the recreation participants at Westbrook preclude use of the travel-cost method. Many boat owners/users own summer homes at Westbrook and many other travel from neighboring states (MA, NY, NJ, PA). Others travel to Westbrook even though their permanent residence is closer to other small boat harbors. Therefore the cost of travel is not a significant variable in the decision to recreate at Westbrook. In addition, the average boat at Westbrook is relatively large (30+ feet) which makes the recreation activity quite specialized. For those who do participate in recreational boating at Westbrook the travel cost/site use relationship is inelastic.

The Contingent Value Method of estimating willingness to pay obtains estimates of changes in NED benefits by directly asking individuals about their willingness to pay. This method is limited by the requirement of having all survey forms subject to the clearance procedures of OMB. Since a list of approved survey questions needed to apply this technique to recreational boating does not currently exist, the amount of time required to obtain specific survey authority precludes its use.

The Unit Day Value Method or Capacity Method was chosen based on its simplicity, ease of application and its ability to measure increases in efficiency (benefits) at the study site. Also, the improvements at the site would result in a less than 500,000 user-day increase, therefore this study meets that criterion of use.

In most cases the unit-day value method measures an increase in the capacity of the recreation site based on project improvements and the resulting increase in the number of total recreator user days. For the Patchogue River study, it is assumed that capacity would remain the same under both the without and with project conditions. This is because the existing marinas and mooring areas are full to capacity and project improvements will not provide space for additional boats. Rather the improvements are intended to reduce the navigational problems in the channel which cause delays to the existing fleet. By reducing the delay time, which is recreation time foregone, actual recreation time would be increased and can be quantified in terms of user days. Due to the physical limitations of the channel and the size of the fleet, it is impossible to reduce recreation time foregone by 100 percent. However, each alternate

plan would reduce delays and the dollar value of the incremental recreation time provided is the measure of the benefit to each alternative.

Marina owners, boat owners and other knowledgeable local sources were questioned in an effort to ascertain the average delay that a recreational boat would face entering and navigating the 1,800 foot long channel. The consensus is that a 30 minute delay each way (one hour round trip) on average throughout the boating season would be encountered by a vessel on each recreational trip. The delay is based on congestion and grounding due to inadequate channel width.

Profile of Fleet

In order to estimate the total annual dollar value of recreational time foregone the following data are required: the profile of the Westbrook fleet, estimate of users per class of boat, annual days of use, and estimate of unit-day value. The following inventory of the recreational fleet in the project area was provided by local marina operators. A check of State of Connecticut boat registration lists was also made for verification purposes. Boat user figures are estimates based on past studies and interviews.

Table 3-1
Recreational Fleet in Study Area and User Estimates

FLEET IN STUDY AREA

<u>Type of Boat</u>	<u>Length</u>	<u># on Class</u>	<u>Avg. # of users per boat type</u>	<u>Total Users (users x boats)</u>
Outboards	15-20	25	2	50
	21 and up	7	3	21
Sterndrives	15 - 20	-	-	-
	21 - 25	49	4	196
	26 and up	-	-	-
Inboards	15 - 20	2	2	4
	21 - 30	58	4	232
	31 - 40	396	5	1,980
	41 - 50	95	6	570
	51 and up	-	-	-
Cruising Sailboats	15 - 20	2	2	4
	21 - 30	643	3	1,929
	31 - 40	270	4	1,080
	41 and up	191	5	955

Day Sailers	8 - 15	4	1	4
	16 - 20	49	2	98
	21 - 25	11	4	44
	26 and up	-	-	-
TOTAL		1,802		7,167
<u>Boat-Use Days per Season</u>				

Total days of use per season was based on a boating season from 1 June to 15 September. Factoring in constraints of limited vacation time, inclement weather etc. the following use per season was estimated.

75% of 30 available weekend days = 23 days
 20% of 75 available weekdays = 15 days
 Average Boating User Days per Season = 38 days

Unit Day Value

The unit day value was estimated in accordance with procedures contained in Appendix 3 to Subpart K of the WRC Manual. Recreational boating is considered to be "specialized recreation other than hunting and fishing." Point values were assigned for each criteria utilizing Table K-3-3.

<u>Criteria</u>	<u>Value</u>
Recreation Experience	10
Availability of Opportunity	10
Carrying Capacity	10
Accessibility	15
Environmental Quality	15
Total	60

The rating points were converted to a dollar value by utilizing the conversion table (Revised Table K-3-1-FY 1982) found in the WRC FY 1982 Reference Handbook. Sixty points represents a unit day recreation value of \$10.00.

Value of Delay Time

It has now been established that the unit day recreator value is \$10.00/day, each boat is used approximately 38 days per season and the entire fleet represents 7,167 recreational uses or visitor days. With the existing delay of 1 hour per round trip per day, the annual value of recreation time foregone amounts to \$340,400 based on the calculations below.

Recreational time foregone per day	=	1 hour
Average amount of boating days per season	=	38 days
Hours foregone per season per boat (38 x 1)	=	38 hours
Days foregone per person (38 ÷ 8)	=	4.75 days
Unit-day value for specialized recreation	=	\$10.00

Recreation value foregone per recreator day		
per season (4.75 x \$10.00)	=	\$47.50
Total amount of recreator days in fleet	=	7,167

Total Value of Recreation Time Foregone		
(7,167 x \$47.50)	=	\$340,400

Alternatively:

Hours foregone per recreator per season	=	38 hours
Number of recreators in the fleet	=	7,167
Total hours foregone per season (7,167 x 38)	=	272,346
Total days foregone per season (272,346 ÷ 8)	=	34,043
Unit-day recreator value	=	\$10.00

Total Value of Recreation Time Foregone		
(34,043 x \$10.00)	=	\$340,400

Alternative plans were formulated based on increasing the efficiency of the navigation system through the widening of the channel to 100, 125 or 150 feet. No additional vessels are expected to be added to the fleet under the with project condition. The intent of the channel widening is to increase the recreation time of the existing fleet by means of a faster and more efficient passage of the fleet through the channel. An added benefit is the increase in safety by decreasing the potential of grounding and collisions.

Existing Navigation System

It is assumed, based on local interviews, that on average 60 percent of the fleet will be utilizing the channel in the morning to travel to Long Island Sound and then return in late afternoon. Sixty percent of the 1802 boat fleet is 1,081 boats. The existing channel is 75 feet wide and 8 feet deep which allows for 2 lanes of one way traffic. The existing channel can pass the 1,081 boats in 2 hours and 15 minutes based on the following parameters.

- 75' wide channel
- 2 lanes - both utilized for the same direction
- 4 m.p.h. speed
- 90' of channel occupied by each vessel (30' average length, 30' fore & aft clearance)
- 1,081 vessels - 540 per each lane
- 4 vessels per minute clear channel per lane
- 1 vessel enters the channel (each lane) every 15 seconds
- 240 boats pass through each lane per hour
- in 2 hours, 960 boats pass through the two lanes
- in 15 additional minutes, 120 boats pass through the two lanes

It therefore takes 2 hours and 15 minutes to pass the 1,080 boats through the channel into Long Island Sound. As stated previously, the average one way delay faced by each boat is 30 minutes per one-way passage. Proposed increases in channel width will be analyzed to measure their impact on navigational efficiency and the resulting decrease in delay time.

Evaluation of Alternative Plans

PLAN A

Plan A would increase the width of the existing channel from 75 feet to 100 feet. This would provide one additional lane for traffic. Utilizing the same methodology that was employed to establish the base condition will give a measure of the increase in navigational efficiency provided by Plan A.

- 100' wide channel
- Three lanes - 360 boats per lane
- each lane passes 240 boats per hour
- the three lanes pass 720 boats per hour
- 360 more boats pass in 30 minutes
- the 1,080 boats are passed in 1 hour and 30 minutes

Time Required to Pass 1,080 Boats (1 way)

Existing (75' width)	2 hours 15 minutes
Plan A (100' width)	1 hour 30 minutes
Time Savings	45 minutes
Efficiency Increase	$(45 \text{ min} / 135 \text{ min}) = 33.3\%$

The addition of one extra traffic lane reduces the time for a one-way passage of the fleet through the channel by 45 minutes which is a 33 percent increase in efficiency. This increase in efficiency decreases recreational time foregone; therefore recreators face a 20 minute delay instead of a 30 minute delay. Converting minutes into days, summing total days for the fleet and applying the unit day value gives the new reduced measure of recreation time foregone under Plan A. Comparing this figure with existing value gives the following benefit:

- 38 days x 40 min (R.T.) foregone = 1520 minutes or 25.33 hours
- 7,167 recreators x 25.33 hours = 181,540 hours or 22,693 days
- 22,693 days x \$10.00/day = \$226,930 foregone

Value of Recreation Foregone

Existing	\$340,400
Plan A	\$227,000
PLAN A: Annual Benefit =	\$113,400

PLAN B

Plan B would increase the width of the existing channel from 75 feet to 125 feet. This would provide two additional lanes of traffic. Using the same methodology as that of Plan A will measure the increase in navigational efficiency of this plan.

- 125' wide channel
- 4 lanes - 270 boats per lane
- each lane passes 240 boats per hour
- 960 pass in one hour
- 120 more pass in 7.5 minutes
- entire 1,080 boats pass channel in one hour and 8 minutes

Time Required to Pass 1,080 Boats (1-way)

Existing (75' width)	2 hours 15 minutes
PLAN B (125' width)	1 hour 8 minutes
Time Savings	1 hour 7 minutes
Efficiency Increase	(67 min ÷ 135 min) = 50%

The addition of two extra traffic lanes reduces the time to pass the fleet into Long Island Sound by one hour and 8 minutes which is a 50 percent increase in navigational efficiency. Recreators now face an average 15 minute delay each way or 30 minutes round trip. Converting minutes into days and applying the unit day value gives the new reduced measure of recreation time foregone under PLAN B.

38 days x 30 minutes (round trip) foregone = 1,140 minutes or 19 hours
7,167 recreators x 19 hours = 136,173 hours or 17,021.6 days
17,021.6 days x \$10.00/day = \$170,216

Value of Recreation Foregone

Existing	\$340,400
PLAN B	170,200
PLAN B: Annual Benefit =	\$170,200

PLAN C

Plan C would increase the width of the channel from 75 feet to 150 feet. This doubling of the existing width would allow for the maximum physical expansion possible without impacting on the existing shoreline. The creation of three lanes to supplement the existing two would provide the fleet with the optimal navigation system in terms of the efficient movement from the home port to Long Island Sound. However, this same situation would not exist as the fleet left Long Island Sound and returned to their slips through the channel. This is because of the existing

navigable widths of the Patchogue and Menunketesuck Rivers are 75 feet each allowing 2 lanes per river. Under Plan C five lanes of traffic would empty into the 4 combined existing lanes at the confluence of the two rivers. Since the fleet is divided virtually evenly between marinas on the two rivers, it is evident that incoming traffic in the fifth lane must slow and merge with another lane to enter the appropriate river. Therefore the benefit of reducing foregone recreation time for Plan C must be estimated in two parts, i.e., incoming and outgoing navigation.

INCOMING

The five lanes of incoming traffic in the channel will be forced to merge into the 4 existing lanes provided at the confluence of the Menunketesuck and Patchogue Rivers. Boats in the fifth lane will either have to wait, upon reaching the confluence, for the fourth lane to clear or more realistically merge with the boats in the fourth lane. Since it takes only 5 minutes to travel the 1800 foot channel at 4 m.p.h., the congestion and delay encountered in the fourth and five lanes at the confluence negates any incoming benefit to the fifth lane. This lane will serve however as an additional buffer for safety. Total incoming benefits for PLAN C in terms of recreational time foregone are therefore the same as those for PLAN B with its four lanes. This amounts to 50 percent of PLAN B round trip benefits ($\$170,200 \times .50 = \$85,100.$).

OUTGOING

If PLAN C had 5 traffic lanes emptying from the two rivers into the channel, then the entire fleet would benefit. However, as mentioned above, four lanes feed the channel. Thus the five lane channel can not be utilized to its maximum potential. Basically every fifth boat would benefit from the fifth lane, but the previous four boats would face the same situation as the 4 lane PLAN B. Eighty percent of the fleet would face the 50 percent increase in recreation time (the same as PLAN B), but 20 percent of the fleet would realize a 60 % increase, due to the fifth lane. The combined outgoing benefit is calculated below.

80% of the Fleet

- 50% increase in efficiency
- 15 minutes foregone per one-way passage
- 5,734 users affected (80% of 7,167)
- 38 days x 15 minutes foregone = 570 min. or 9.5 hours
- 9.5 hours x 5,734 users = 54,473 hours or 6,809 days
- 6,809 days x \$10.00/day = \$68,090 foregone

20% of the Fleet

- 60% increase in efficiency
- 12 minutes foregone per one-way passage
- 1,433 users affected (20% of 7,167)
- 38 days x 12 minutes foregone = 456 min. or 7.6 hrs.
- 7.6 hrs x 1,433 users = 10,891 hours or 1,361 days
- 1,361 days x \$10.00/day = \$13,610 foregone

Total Outgoing Time Foregone = (80%):	\$ 68,090
(20%):	\$ 13,610
Total Incoming Time Foregone =	\$ 85,100
TOTAL PLAN C	\$166,800

Value of Recreation Foregone

Existing	\$340,400
PLAN C	<u>166,800</u>

PLAN C: Annual Benefit \$173,600

The summary of economic analysis for the recreational boat fleet is found in the table below:

SUMMARY OF BENEFITS

Table 3-2
Summary of Recreational Benefits

	<u>Existing</u>	<u>Plan A</u>	<u>Plan B</u>	<u>Plan C</u>
Channel Width	75'	100'	125'	150'
Number of Lanes	2	3	4	5
Value of Recreational Time Foregone	\$340,400	\$227,000	\$170,200	\$166,800
Annual Benefits		\$113,400	\$170,200	\$173,600

Economic Analysis - Commercial Fishing

Methodology

In addition to the benefits which will accrue to the recreational fleet with improved channel conditions, the commercial fishing fleet based at Westbrook will also realize gains in navigational efficiency. The benefits to the commercial boats however are measured under different criteria than those in the recreational fleet analysis. The NED benefit evaluation procedures for commercial fishing are found in the Water Resources Council Manual, Part 713, Subpart L. The benefits are measured as "the increase in net income to fish harvesters as a result of a plan." Since the commercial fleet is small (21 boats) and the channel

improvements will have no direct foreseeable effect on future catch levels, the benefits are measured as the reduction in operating costs with project improvements versus the existing condition. Decreases in operating costs result in increased net income.

Commercial Fishing Fleet

Westbrook is the homeport to 21 commercial fishing vessels. They range in length from 15 to 45 feet and have loaded drafts from 1 foot to 5 feet. The average vessel is a 30 footer with a 4 foot draft that harvests both lobsters and groundfish. A questionnaire was distributed to the Westbrook fisherman and the responses were used as the basis for the commercial fishing benefit analysis.

Existing Navigation System

The existing channel is 8 feet deep at MLW. The largest vessel in the commercial fleet is a 45 foot dragger which draws 5 feet fully loaded. The average loaded draft of the fleet is 3 1/2 to 4 1/2 feet. It appears that the channel offers adequate depth at MLW (8 feet) to the existing fleet. However the fishermen report that the major problem they encounter is grounding at low tide when the navigable channel width is constricted. The large number of recreational boats using the channel at certain times of the summer season exacerbate the problem by increasing congestion and decreasing maneuverability.

The commercial vessels do not normally encounter significant delays during most weekday trips. On weekends and selected weekdays during heavy vacation periods though, delays are encountered while leaving and returning to port through the channel. Therefore the fishing boats will encounter delays on the same days when the heaviest recreational traffic was projected. This amounts to approximately 38 days per year; the derivation of this number is contained in the recreational benefit discussion. As previously mentioned, the consensus is that a 30 minute delay each way (one hour per round trip) an average throughout the heaviest traffic days of the recreational boating season would be encountered by each vessel due to inadequate channel width.

VALUE OF DELAY TIME

Operating Costs

The harvesting costs associated with a commercial fishing vessel are the same as most productive enterprises in that total costs are comprised of fixed costs (loans for vessel, equipment, insurance, etc.) and variable costs (labor, fuel, bait, etc.). The widening of the channel will result in a reduction of delay time and increase in net income through a reduction in certain variable or operating costs. The two major operating costs that will be reduced are fuel costs and labor costs.

Fuel Costs

Fuel costs incurred during the delays and congestion stem from the additional idling and maneuvering of the vessel required. The estimate of this cost to the commercial fleet under existing conditions is estimated as follows. The 21 boat fleet can be divided into two parts; 8 boats 26 feet in length and under, and 13 boats 28 feet in length and greater. The boats under 26 feet will burn 3 gallons of fuel per hour under delay conditions while those 28 feet and greater will burn 4 gallons.

Extra Fuel Cost Due to Delays:

26' and under:

8 boats x 38 days x 1 hr/day x 3 gals/hr x \$1.30/gal = \$1,186

28' and greater:

13 boats x 38 days x 1 hr/day x 4 gals/hr x \$1.30 gal = \$2,569

Total Fuel Cost = \$3,755

Labor Costs

Although monetary compensation for the captain and crew of a fishing vessel is usually based on a "share" system of each trip's catch, an hourly wage will be employed for this analysis. Current WRC Manual guidance states:

"Purchased input shall be valued at current market prices. All labor, whether operator, hired or family shall be valued at prevailing labor rates."

The current prevailing rate for this type of labor in the Middletown Ct. Labor Market Area, to which Westbrook belongs, is approximately \$8.00 per hour. The vessel owners responding to the Corps questionnaire reported a labor force of 17 self employed, 4 full time help, and 12 part timers. Expanding this labor force to cover the entire 21 boat fleet and converting part-time help to full time results in a labor force of 35 people. Productive labor time foregone due to delays and congestion in the channel is calculated as follows:

35 people x 38 days x 1 hr/day x \$8.00 hr = \$10,640

Total Dollar Value of Delay

The total dollar value of the annual delay faced by the 21 boat commercial fleet is \$14,400.

Fuel Cost = \$ 3,755

Labor Cost = \$10,640

Total = \$14,405 rounded to \$14,400

Evaluation of Alternative Plans

The benefit to the commercial fishing vessels from proposed increases in channel width is measured as the decrease in the total dollar value of the annual delay (\$14,400) now faced by the fleet. The increases in navigational efficiency which decrease delay time for Plans A, B, and C for the fishing vessels are the same percentage efficiencies which were estimated for the recreational fleet. A full derivation of these efficiencies is found in the recreational boating analysis. The use of the same time standard for both fleets is necessary since the different boats do not leave and enter the channel independently of one another, but most often will be intermixed in traffic and travel concurrently

PLAN A

Plan A would increase the width of the existing channel from 75 to 100 feet. This would provide one additional lane for traffic thereby decreasing overall delay time by 33.3 percent. The one hour on average delay per round trip would be reduced to 40 minutes. The annual benefit is \$4,800 and is calculated below.

	<u>Value of Delay Time</u>
Existing	\$14,400
W/Plan A	9,600
PLAN A: Annual Benefit =	\$ 4,800

PLAN B

Plan B would increase the width of the existing channel from 75 to 125 feet. This would provide two additional lanes of traffic with a subsequent reduction in delay time of 50 percent. The one hour on average delay per round trip would be reduced to 30 minutes and an annual benefit of \$7,200 would result.

	<u>Value of Delay Time</u>
Existing	\$14,400
W/Plan B	7,200
PLAN B: Annual Benefit =	\$ 7,200

PLAN C

Plan C would increase the width of the existing channel from 75 feet to 150 feet. This is the maximum physical expansion that can be undertaken without physically impacting on the existing shoreline. Plan C would provide 3 additional lanes in the channel which when combined with

the two existing lanes would result in five lanes. Because these five channel lanes would meet four existing lanes at the confluence of the Patchogue and Menunketesuck Rivers (2 lanes each river), benefits must be estimated separately for incoming and outgoing traffic. An explanation of the navigational patterns and associated rationale for Plan C is found in the recreation boating analysis. Commercial benefits are estimated below:

INCOMING:

- same benefit (incoming) as PLAN B
- existing round trip delay = \$14,400
- existing one-way delay = \$7,200
- 50 percent increase in efficiency

Value of Time Delay

Existing	\$ 7,200
W/Plan C	3,600

Annual Benefit (Incoming) =	\$ 3,600
-----------------------------	----------

OUTGOING:

- 80 percent of the fleet (17 boats) realize a 50 percent efficiency increase
- 20 percent of the fleet (4 boats) realize a 60 percent efficiency increase

80% of the Fleet

- 17 boats face a round trip delay valued at \$11,600 annually
- the value of a one-way delay is \$5,800
- 50 percent increase in efficiency

Value of Delay Time

Existing	\$5,800
W/Plan C	\$2,900

Annual Benefit =	\$2,900
------------------	---------

20% of the Fleet

- 4 boats face a round trip delay valued at \$2,800 annually
- existing one-way delay = \$1,400
- 60 percent increase in efficiency

Value of Delay Time

Existing	\$1,400
W/Plan C	560

Annual Benefit =	\$ 840
------------------	--------

The total dollar value of benefits for Plan C is \$7,340 and comprised of the following individual benefits.

Incoming	\$3,600
Outgoing	
(80% of fleet)	2,900
(20% of fleet)	840
TOTAL (PLAN C)	<u>\$7,340</u>
	rounded to \$7,300

SUMMARY OF BENEFITS

TABLE 3-3
Summary of Commercial Fishing Benefits

	<u>Existing</u>	<u>Plan A</u>	<u>Plan B</u>	<u>Plan C</u>
Channel Width	75'	100'	125'	150'
Number of Lanes	2	3	4	5
Value of Commercial Time Foregone	\$14,400	\$9,600	\$7,200	\$7,100
Annual Benefits		\$4,800	\$7,200	\$7,300

SUMMARY OF ECONOMIC ANALYSIS

In order to obtain the total magnitude of benefits that will accrue to vessels who utilize the channel, recreational and commercial benefits must be combined. Total benefits are displayed in the table below along with annual costs and the benefit/cost ratio for each plan.

TABLE 3-4
Summary of Economic Analysis

	<u>Existing</u>	<u>Plan A</u>	<u>Plan B</u>	<u>Plan C</u>
Channel Width	75'	100'	125'	150'
Number of Lanes	2	3	4	5
Value of Time Foregone due to Delays/Congestion:				
-Recreational	\$340,400	\$227,000	\$170,200	\$166,800
-Commercial Fishing	14,400	9,600	7,200	7,100
Total	\$354,800	\$236,600	\$177,400	\$173,900
Annual Benefits				
-Recreational	--	\$113,400	\$170,200	\$173,600
-Commercial Fishing	--	4,800	7,200	7,300
Total	--	\$118,200	\$177,400	\$180,900

Annual Costs	--	\$16,100	\$24,500	\$32,500
Benefit/Cost Ratio	--	7.3 to 1	7.2 to 1	5.6 to 1
Net Benefits	--	\$102,100	\$152,900	\$148,400

Maximization of Benefits

The measure of economic justification for a project is a benefit/cost ratio equal to 1.0 or greater. From table 3-4 it is evident that all plans are economically justified. Therefore, an additional criterion must be applied to select a plan for implementation. This criterion is the maximization of net benefits. Net benefits are the dollar amount of benefits that remain after total annual costs of a plan have been subtracted from the plan's total annual benefits. The plan which displays the maximum amount of net benefits will cause the greatest beneficial impact per dollar of public investment and thereby contribute the most to national economic development. Plan B, the 125 foot wide channel, has the maximum amount of net benefits, \$152,900, and is therefore the plan selected for implementation.

SENSITIVITY ANALYSIS

The following is an analysis of project costs based on an interest rate of 7-7/8 percent.

PLAN	A	B	C
TOTAL FIRST COST	\$138,000	\$184,000	\$225,000
ANNUAL CHARGES I & A (7-7/8%)	11,100	14,800	18,100
MAINTENANCE DREDGING	4,800	9,600	14,400
MAINTENANCE OF AIDS TO NAVIGATION	<u>500</u>	<u>500</u>	<u>500</u>
TOTAL ANNUAL COSTS	\$ 16,400	\$ 24,900	\$ 33,000
ANNUAL BENEFITS	118,200	177,400	180,900
BENEFIT-COST RATIO	7.2	7.1	5.5
EXCESS NET BENEFITS	\$101,800	\$152,500	\$147,900

PATCHOGUE RIVER
WESTBROOK, CONNECTICUT

DETAILED PROJECT REPORT
PUBLIC VIEWS AND RESPONSES

APPENDIX 4

PREPARED BY:

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS

APPENDIX 4

PUBLIC VIEWS AND RESPONSES

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PUBLIC VIEWS AND RESPONSES
SECTION A

PUBLIC INVOLVEMENT PROGRAM

Views of Government agencies were obtained through initial contacts by telephone, written correspondence and meetings. Meetings were held with Federal, State, and local officials, private interests and concerned citizens to ascertain their views on the proposed improvement project and enlist their aid in determining community needs and trends, and developing baseline studies. The following is a summary of the major comments received during the coordination phase.

PUBLIC WORKSHOP

On 19 August 1982 at 7:30 pm. a public meeting on the Navigation Improvement Project for the Patchogue River was held at Town Hall in Westbrook. The purpose of this meeting was to present the alternative improvement plans evaluated and the plan of improvement recommended by the Corps of Engineers to the general public. Approximately 35 individuals attended this forum.

FEDERAL AGENCIES

U.S. Department of the Interior, Fish and Wildlife Service

Identified an opportunity for enhancement of the environment by nourishing Grove Beach with the dredged materials. Stated that the placement of sand on the beach is not expected to significantly impact resources of the immediate area if placed above mean low water and that dredging the lower Patchogue is not likely to cause significant or long term environmental impacts.

U.S. Coast Guard

No objection to the proposed project.

U.S. Environmental Protection Agency

No objection to the proposed project.

STATE AGENCIES

Department of Environmental Protection

Recommended enhancing Grove Beach with the dredged material. Recommended elimination of Menunketesuck Island as a potential nourishment area due to environmental and legal issues. DEP has determined that the project is consistent with the Connecticut Coastal Area Management Plan and has issued a Water Quality Certificate for the proposed project.

Governor William A. O'Neill

Stated that the project has merit and should go forth.

State Historic Preservation Officer

The project as proposed will have no impact upon the State's heritage.

LOCAL GOVERNMENT AGENCIES

Town of Westbrook

Formally requested a Federal small navigation improvement study of the feasibility of channel widening to facilitate navigation in the Patchogue River on 11 February 1975.

In subsequent communications, has reiterated the towns continued interest in navigation improvements and has indicated that the town has the ability to participate in the cost of the project.

OTHER INTERESTS

Grove Beach Point Association

In a letter dated 1 August 1981 requested that dredged material from the proposed navigation improvement be deposited on Grove Beach for restoration purposes.

SECTION B .

COPIES OF CORRESPONDENCE

TOWN OF WESTBROOK

ELECTMEN

WILLIAM G. WININGER
P. RIGGIO
F. DeCRISTOFORO
COLLECTOR
JOY M. NIELSEN

CONNECTICUT
06498

HALL OF RECORDS
PHONE: 399-6236

ASSESSORS

MAURO A. BISACCIA
JOAN O. HOLBROOK
LLOYD L. RUSSELL
TOWN CLERK
ETHEL M. ERICKSON

February 11, 1975

Colonel John Mason
Division Engineer
New England Division, Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

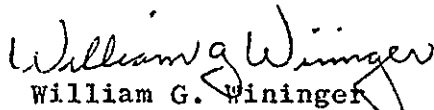
Dear Sir:

In accordance with the provisions of Section 107 of the River and Harbor Act of July 14., 1960, as amended, which authorizes the Federal Government to cause investigations and studies to be made in the interests of navigation, the Town of Westbrook hereby makes formal application for a study to widen the harbor entrance to the Patchogue and Menunketesuck rivers, in Westbrook, Conn.

The Town of Westbrook fully understands and will comply with the requirements of local cooperation and participation in implementing a Federal small navigation improvement.

The Town of Westbrook feels that the existing entrance, 75 feet wide, is not adequate for the safe navigation of the 1200 boats that are already moored in the harbor, and for the additional 300 - 450 boats planned for in marina expansion programs.

Very truly yours,


William G. Wininger
First Selectman
Town of Westbrook, Conn.



UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
Division of Ecological Services
P. O. Box 1518
55 Pleasant Street
Concord, New Hampshire 03301

January 20, 1976

Division Engineer
New England Division, Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Sir:

This is our Preliminary Report on your study dated October 1975 for navigation improvements in the Patchogue River, Westbrook, Middlesex County, Connecticut. The study is authorized under Section 107 of the River and Harbor Act enacted 14 July 1960, as amended. This Service has previously reported on maintenance dredging of the Federal channel on October 1, 1972, and May 16, 1972. This report is submitted in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

The project as outlined in your Draft Reconnaissance Report consists of widening to 150 feet the existing Federal channel which is 75 feet wide, 8 feet deep and 5,100 feet long, and placing the spoil at the Duck Island disposal site which has been used in the past. Alternatives being considered include:

- (1) Variations in the proposed inlet channel width; e.g., 100-foot and 125-foot widths;
- (2) Extending the proposed channel widening to about the second bend in the existing channel, an additional distance of about 1,200 feet beyond the proposed widening of 1,800 feet; and
- (3) Dredging a new channel in the Menunketesuck River.

The Patchogue River is a tidal stream which empties into Long Island Sound. The larger Menunketesuck River joins the Patchogue at its mouth. Route 1 parallels the coast and crosses over both rivers. Downstream of these bridges, including the Federal channel area, there has been extensive marina development. This human activity with related pollution has



21 JAN 1976

resulted in limited undisturbed fish and wildlife resources in this area. However, a variety of fish and wildlife is present upstream from the Menunketesuck River bridge. Bordering a portion of the Menunketesuck above the Route 1 bridge is the Salt Meadow National Wildlife Refuge, which includes approximately 177 acres of habitat for waterfowl and other wildlife. In this area of the Menunketesuck, the fertile mud bottom supports mud shrimp, amphipods, isopods, polychaete worms, small crabs, lobsters, clams and oysters. Important fish species in both rivers include striped bass, bluefish, flounder, silversides, shad, fluke, white perch, and menhaden. The saltmarsh on the Refuge supplies nutrients to the Menunketesuck River and thus plays an important role in supporting these species. Water-oriented birds including black duck, mallards, scoter, overwintering grebes and blue herons frequent the project area. The Duck Island spoil site contains phragmites saltmarsh where spoil has been previously placed. There are areas of Spartina alterniflora, a very productive marsh type, along the edges of the spoil site.

Environmental impacts resulting from widening the channel in the lower portions of the Patchogue and placing the spoil at the Duck Island site are not likely to be significant or long term.

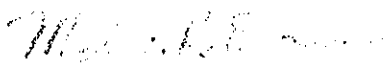
Channelization of the Menunketesuck River upstream from the Route 1 bridge, however, would have both direct and indirect adverse effects on the environment of the area. Dredging here will destroy the benthic organisms and their habitat and adversely impact the Salt Meadow National Wildlife Refuge by altering water transport into and out of the Refuge, increasing turbidity, and possibly disturbing the marsh at the edge of the Refuge. The improved navigation would encourage marina development in the only area that has not been extensively developed and further tax an already stressed environment. Boat wakes will result in active erosion of the Refuge's marsh.

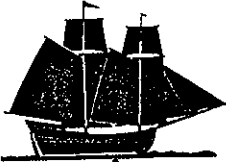
The U. S. Fish and Wildlife Service recommends that:

1. The spoil be placed on previously disturbed wetlands and diked in order to prevent intrusion into the areas of viable wetlands and protect the alterniflora fringe marsh.
2. No channelization be done upstream of the Route 1 bridge in the Menunketesuck River.

We would be pleased to assist you in the various stages of project planning and we will be preparing a conservation and development report on your final proposal. We are hopeful that as a result of our coordinated planning and study efforts, an environmentally acceptable solution to the navigation problem can be developed.

Sincerely yours,


Melvin R. Evans
Area Office Supervisor, NEAO



TOWN OF WESTBROOK

WESTBROOK, CONNECTICUT 06498
203 / 399-6236

March 27, 1978

Dept. of the Army
New England Div., Corps of Engineers
424 Trapelo Road
Waltham, Mass. 02154

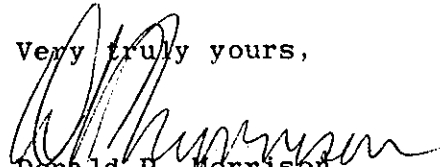
Dear Sirs,

Re: NEDPL - C

Would you give me the status of the project to widen the Patchogue River from 75' to 125'? When do you expect to commence?

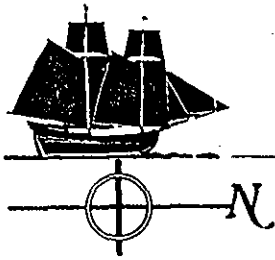
Any information you can give me would be most appreciated in light of the upcoming summer boating season.

Very truly yours,



Donald P. Morrison
First Selectman

DPM:mgf



TOWN OF WESTBROOK

WESTBROOK, CONNECTICUT 06498

203 / 399-6236

April 27, 1978

Ralph T. Garver
Colonel, Corps of Engineers
Dept. of the Army
New England Div., Corps of Engineers
424 Trapelo Road
Waltham, Mass. 02154

Dear Colonel Garver,

RE: NEDPL - C

Thank you for the status report on the study on modification of the existing federal navigation project for the Patchogue River.

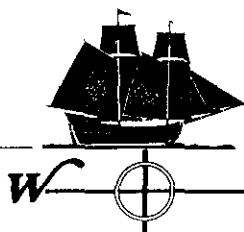
The Town of Westbrook has already set aside \$30,000 as their share of the project (1/3 of \$85,000).

We are looking forward to an early commencement of the project construction.

Very truly yours,

Donald P. Morrison
First Selectman

DPM:mgf



TOWN OF WESTBROOK

WESTBROOK, CONNECTICUT 06498
203/399-6236

April 3, 1979

Ralph T. Garver
Colonel, Corps of Engineers
Dept. of the Army
New England Division
424 Trapelo Road
Waltham, Mass. 02154

Dear Colonel Garver,

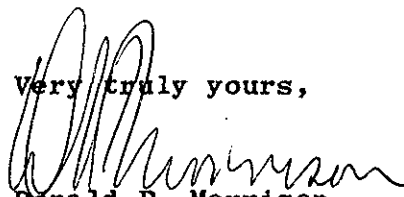
Re: NEDPL-C

I have been trying to reconstruct past history on the contemplated dredging of the Patchogue River. Mr. Garone of your office has been most helpful.

My present question is whether you have in your files, what State organization would pay the 2/3 of the remaining \$85,000. I cannot find any information in our files. The Town has already set aside \$30,000 as our share of the project.

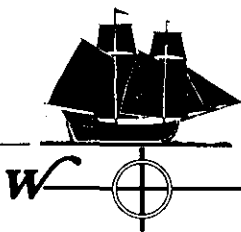
Thanks for your continued help.

Very truly yours,



Donald P. Morrison
First Selectman

DPM:mgh



TOWN OF WESTBROOK

WESTBROOK, CONNECTICUT 06498
203/399-6236

February 7, 1980

Mr. Steve Andon
Army Corps of Engineers
424 Trapelo Road
Waltham, Mass. 02154

Dear Mr. Andon:

We are looking forward to your visit with us on February 20, 1980 at 11:00 A.M.

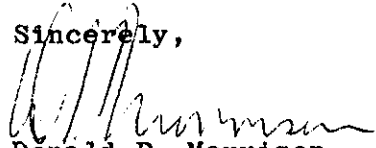
Enclosed is correspondence which may be of help to you in reviewing the project. As you will note it was our understanding that the detailed project report commenced October 1, 1978 per Colonel Garver's letter of April 11, 1978.

I did not hear from the Corps as to whether they received a commitment from the State of Connecticut per my inquiry of June 4, 1979.

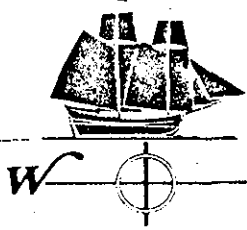
Senator Schneller will file an appropriation bill this session but the chance of passage is slim. In light of our telephone conversation possibly we should hold off a year.

We can review all the above on February 20th.

Sincerely,


Donald P. Morrison
First Selectman

DPM:mgh



TOWN OF WESTBROOK

WESTBROOK, CONNECTICUT 06498

203.399-6236

March 6, 1980

Michael D. Misslin, Civil Engineer
Coastal Development Branch
New England Division - Army Corps of Engineers
424 Trapelo Road
Waltham, Mass. 02154

Dear Mike:

We appreciated Don Martin and you bringing us up to date on the Patchogue River Dredging Project. Obviously we were extremely disappointed that the Corps had not started the Detailed Project Report. We appreciate the apologies expressed by Don Martin on behalf of the Army Corps of Engineers.

It is good to know that the Project is still viable and that monies are being requested by you for the fiscal year starting October 1, 1980. Your assurance that if money is approved you will start immediately on the final phase of the Project. This would prevent our appropriation from being reallocated to other projects during the year ...which situation, as you admitted, has happened during the past two years.

As you could note from Mrs. Bassett, Messrs Ruppenicker, Daly and Riggio, we are concerned about the safe navigation, commercial fishing and soil erosion.

Your thought that the Project could be tied in with a maintenance dredging to save money is excellent.


We have the spoils dumping site indicated which would correct the dramatic soil erosion on Grove Beach. We have the local share of dollars in place.

Michael D. Misslin Page 2 March 6, 1980

Would you send us a copy of the Final Reconnaissance Report which was completed in June of 1977? We would also appreciate a copy of the contract the Town of Westbrook executed with the Corps in 1956.

Thanks again for your candor. Let's hope we can see actual dredging start in 1982.

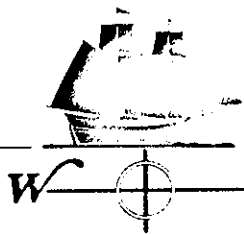
Sincerely,



Donald P. Morrison
First Selectman

DPM:mgh

X-c: Senator Richard F. Schneller
Gail Bassett, Chairman, Harbor Commission
William H. Daly, Selectman and member of Dredging Commission
John P. Riggio, Selectman
Edward Carter, Chairman, Dredging Commission
David C. Holbrook, Chairman, Finance Committee



TOWN OF WESTBROOK

WESTBROOK, CONNECTICUT 06498
203/399-6236

April 22, 1980

Ralph T. Garver, Colonel
Army Corps of Engineers
New England Division
424 Trapelo Road
Waltham, Mass. 02154

Re: Patchogue River Dredging

Dear Colonel Garver:

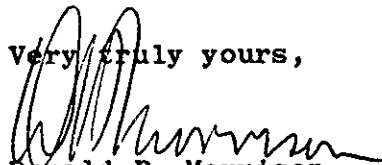
This is a follow up to my letter of January 23, 1980 concerning the dredging of the mouth of the Patchogue River.

On March 5, 1980, we met with your representatives, Messrs Martin and Misslin. Attached is a summary of our meeting in a confirming letter dated March 6, 1980 to Mike Misslin.

I hope you will be able to embark on the Detailed Project Report as soon as possible.

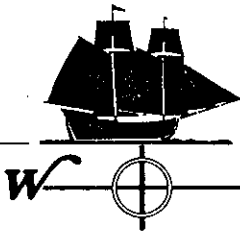
Thanks for your continued interest.

Very truly yours,



Donald P. Morrison
First Selectman

DPM:mgh
attach.



TOWN OF WESTBROOK

WESTBROOK, CONNECTICUT 06498

203/399-6236

June 11, 1980

Michael D. Misslin, Civil Engineer
Coastal Development Branch
Army Corps of Engineers
424 Trapelo Road
Waltham, Mass. 02154

Dear Mike:

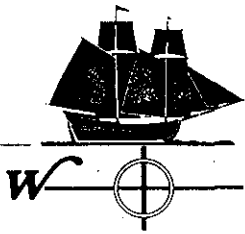
I was curious as to whether you have had an opportunity to review the Patchogue River Dredging Project site since our last meeting on March 5, 1980. You had stated at the meeting you were going to make some preliminary trips during the summer in preparation to commencing on the Detailed Project Report.

Sincerely,



Donald P. Morrison
First Selectman

DPM:mgh



TOWN OF WESTBROOK

WESTBROOK, CONNECTICUT 06498
203/399-6236

October 23, 1980

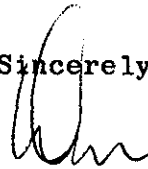
Michael D. Misslin, Civil Engineer
Coastal Development Branch
Army Corps of Engineers
424 Trapelo Road
Waltham, Mass. 02154

Dear Mike:

Since your visit on August 12 to investigate our commercial fishing, I am curious as to the status of our Patchogue River Dredging Project.

Do you have funding as of October 1 to commence the detailed study?

Sincerely,


Donald P. Morrison
First Selectman

DPM:mgh



Grove Beach Point Association, Inc.

WESTBROOK, CONN.

1 August 1981

Michael D. Misslin
Civil Engineer
Army Corps of Eng.
424 Trapelo Rd.
Waltham, Mass. 02154

Re: Dredging of mouth of Patchogue River
and Menunketesuck River, Westbrook, Ct.

Dear Mr. Misslin,

I am writing to you at the suggestion of Don Morrison and Bill Daly, Selectmen of Westbrook.

Several months ago our Association requested the Town to consider depositing the spoils from the dredging of the mouth of the rivers onto the areas in front of the seawalls at Grove Beach Point, west of the stone jetty at the mouth of the rivers. This area has been subject to severe erosion following the construction of the jetty and is in need of this fill to help correct the erosion.

At the 1981 Annual Meeting of our Association the members unanimously approved a resolution approving the depositing of the spoils on our property (the "bathing beach" was deeded to the Association by the original developers for the use of all members). We also approved a resolution permitting vehicles to cross Association property if they are needed to assist in the depositing of the spoils.

We trust that when the dredging is undertaken the Corps will act in accordance with our request to the Town.

Sincerely

Edward M. Carter
for the Board of Governors
Grove Beach Point Assoc., Inc.

74 Menunketesuck Road
Westbrook, Ct. 06498

cc: D. Morrison, First Selectman, Westbrook



UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
ECOLOGICAL SERVICES
P.O. Box 1518
Concord, New Hampshire 03301

Division Engineer
New England Division, Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02254

OCT 3 1981

Dear Sir:

This letter is intended to aid your planning efforts for navigation improvements of the Federal channel in the Patchogue River, Westbrook, Middlesex County, Connecticut. It has been prepared under authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

We understand that the project consists of widening the existing 8-foot deep, 75-foot wide entrance channel to 150 feet from deep water in Duck Island Roads to the confluence of the Menunketesuck and Patchogue Rivers, a distance of about 1,800 feet. The proposed dredging would yield approximately 40,000 cubic yards of material. Disposal options under consideration include (1) using the material for nourishment of the Grove Beach area, and (2) depositing the material on the present land disposal site of the Duck Island Marine Corporation.

We understand that you will not complete the physical, chemical, and biological testing to determine the nature of the material to be dredged until November 1981. Therefore, this report was prepared under the assumption that the material is relatively clean sand and is subject to change depending upon test results.

The project area and vicinity supports significant finfish and shellfish resources. Anadromous fish species include rainbow smelt, alewife, and blueback herring. Other important fish species include winter flounder, bluefish, summer flounder, tom cod and striped bass.

Recreational fishing by both boat and shore based fishermen is quite heavy within the general project area. The jetty at Grove Beach Point is a favored spot for shore based fishermen. Winter flounder and snapper bluefish are the most frequently caught species.

Shellfish resources include oysters, hard-shell, soft-shell and surf clams, lobsters and crabs. Based on available data, it appears that shellfish within the immediate project area are not of major significance. However, there are significant commercial oyster and hard-shell clam grounds in the offshore area.

Widening the entrance channel to 150 feet is not expected to have a significant impact upon resident fish species. While dredging would destroy some shellfish within the immediate project area, this impact is not expected to be significant.

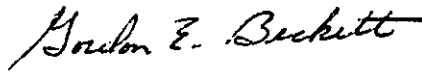
Dredging operations could have an adverse impact upon anadromous fish and the offshore oyster and hard-shell clam resources. Dredging would most likely be detrimental during the reproductive period for these species when suspended sediments and migration of dredged material would interfere with the overall reproductive process. The reproductive period for smelt, alewife and blueback herring generally extends from March to June while the spawning and setting periods for oysters and clams extends from June to the end of September. Thus, the combined reproductive period for these species extends from March 1 to September 30. Dredging the entrance channel during this period is not recommended.

Of the two (2) disposal options, we would prefer to see the dredged material utilized for nourishment of the Grove Beach area since this would represent a more efficient use of a natural resource. Placement of sand on the beach is not expected to significantly impact resources of the immediate area as long as the material is not contaminated and is not placed below mean low water. The most potential for adverse impact is the migration of a large amount of sand from the beach to offshore shellfish beds, especially during the spawning and setting season.

In order to more accurately assess the impacts of this proposed project, we will need additional information. Please forward the data on the bioassay/bioaccumulation and bulk sediment analysis when available. In addition, your studies should include an analysis of the potential migration of material from the dredging area as well as from the disposal area, and the probable area of deposition, so that the impact on benthic habitat can be determined.

We would be pleased to assist you in the various stages of project planning, and we will report on the potential impacts of your selected plan.

Sincerely yours,

A handwritten signature in cursive script that reads "Gordon E. Beckett".

Gordon E. Beckett
Supervisor

Office of the
STATE
HISTORIC
PRESERVATION
OFFICER

for Connecticut

59 SOUTH PROSPECT STREET - HARTFORD, CONNECTICUT 06106 - TEL: (203) 566-3005

October 15, 1982

Mr. Arthur N. Rappaport
Lt. Colonel
Corps of Engineers
Acting Division Engineer
Department of the Army
424 Trapelo Road
Waltham, MA 02254

Subject: Patchogue River, Westbrook, Connecticut

Dear Mr. Rappaport:

The State Historic Preservation Office has reviewed the "Small Navigation Project, Detailed Project Report and Environmental Assessment", prepared by the U.S. Army Corps of Engineers with respect to the above-named project. This Office understands that the recommended plan proposes the expansion of the existing navigational channel from the existing seventy-five feet up to one hundred twenty-five feet from deepwater in Long Island Sound to the confluence of the Patchogue and Menunketesuck Rivers. This Office notes that this document only minimally addresses the issue of cultural resources. This area of Westbrook possesses a high sensitivity for the existence of prehistoric archaeological resources, with several known sites being located immediately adjacent to the proposed bounds of this project. In particular, a series of submerged prehistoric archaeological sites have been identified in the vicinity of Hawkes Nest.

Nonetheless, it is the opinion of the State Historic Preservation Office that this proposed project will have no impact upon this State's heritage. This comment is conditional upon the project being undertaken in strict accordance with the recommended plan as noted within the above-named document. All changes in the design and location of this project should likewise be submitted to this Office for a cultural resource review in accordance with the National Historic Preservation Act of 1966.

For further information please contact Mr. David A. Poirier, Archaeologist.

Sincerely,



John W. Shannahan
State Historic Preservation Officer

DAP:SLS
cc: Mr. John Wilson

4-19

OCT 21 1982

STATE HISTORIC PRESERVATION OFFICER: The person responsible for implementation in Connecticut of the National Historic Preservation Act of 1966 administered by the Department of the Interior, Heritage Conservation and Recreation Service, Washington, D.C.
AN EQUAL OPPORTUNITY EMPLOYER/AFFIRMATIVE ACTION AGENCY



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION I

J. F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203

October 27, 1982

Colonel Carl Sciple
Division Engineer
US Army Corps of Engineers
New England Division
424 Trapelo Road
Waltham, MA 02254

Re: NEDPL-C: Patchogue River, Westbrook, Connecticut
Navigation improvements

Dear Colonel Sciple:

We have reviewed the Draft Detailed Project Report and Environmental Assessment concerning the navigation improvement project being considered for the Patchogue River, Westbrook, Connecticut.

We have no objection to this proposed navigation improvement project. The proposed improvement (Plan B) would widen the navigation channel from 75 feet to 125 feet for a length of 1,800 feet from deep water in Long Island Sound to the confluence of the Patchogue and Menunketesuck Rivers. Hydraulic dredging would be utilized with disposal of approximately 17,500 cubic yards of sand on Grove Beach.

We understand the Final Report will include additional information concerning the present and proposed beach profiles. We further understand that the Connecticut Department of Environmental Protection, Coastal Area Management Unit will study the movement of the sand placed on the beach as a demonstration project.

Please keep us informed of your actions regarding this project by calling Ed Reiner of my staff at 617/223-5470. Please send us a copy of the Final Report when available.

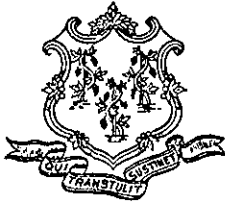
Sincerely,

A handwritten signature in cursive script that reads "Clyde F. Shufelt".

Clyde F. Shufelt, Chief
Municipal Permits Section

cc: US F&WS, Concord, NH
NMFS, Milford, CT
CT DEP, Water Resources Unit, D.Manke
CT DEP, Coastal Area Management Unit, T.Suarez-Murias

WILLIAM A. O'NEILL
GOVERNOR



STATE OF CONNECTICUT
EXECUTIVE CHAMBERS
HARTFORD

October 28, 1982

Mr. Carl B. Sciple
Division Engineer
New England Division
Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02254

Dear Mr. Sciple:

Thank you for providing my office with a copy of your draft Project Report and Environmental Assessment for proposed navigation improvements in the Patchogue River at Westbrook. I have discussed this project with Stanley J. Pac, Commissioner of Environmental Protection, and we agree that the proposed project has merit and should go forth.

Commissioner Pac is currently reviewing the draft Project Report and Environmental Assessment. His staff will contact your office with any questions or comments on this project, or on your requests for water quality certification and concurrence with your determination of federal consistency with Connecticut's Coastal Management Program.

Sincerely,

A handwritten signature in dark ink, appearing to read "Will. A. O'Neill", written over a horizontal line.

WILLIAM A. O'NEILL
Governor



STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION



COASTAL AREA MANAGEMENT PROGRAM

November 12, 1982

Colonel Carl Sciple
Division Engineer
U.S. Army Corps of Engineers
New England Division
424 Trapelo Road
Waltham, Massachusetts 02254

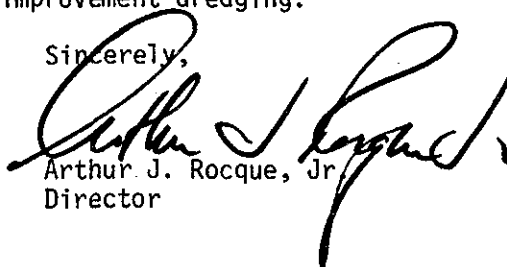
RE: Improvement Dredging at Westbrook Harbor, Connecticut NEDPL-I

Dear Colonel Sciple:

The Planning and Coordination/Coastal Management staff of the Department of Environmental Protection has reviewed your consistency determination and Draft Environmental Assessment for Improvement Dredging at the Patchogue River and entrance channel at Westbrook, CT. The recommended improvement, Plan B, would extend from deep water in Duck Island Roads (Long Island Sound) to the confluence of the Patchogue and Menunketesuck Rivers; widen the channel to 125 feet from 75 feet; and maintain the controlling depth at 8 feet. The dredged material, which is suitable for open water disposal, will be hydraulically dredged and placed below mean high water at Grove Beach, west of the existing Federal jetty. We concur with your determination that this activity is consistent with the Connecticut Coastal Management Program.

Please keep Ms. Tina Suarez-Murias, of my staff, advised of the progress of this project as it moves through the approval, appropriation and construction stages and if there are any changes to the plans. I would also like a copy of the Final Report sent to this office when it is released. Thank you for this opportunity to comment on the improvement dredging.

Sincerely,



Arthur J. Rocque, Jr.
Director

AJR/TSM/mic

cc: Mr. Michael Misslin, Army Corps of Engineers



United States Department of the Interior

FISH AND WILDLIFE SERVICE
ECOLOGICAL SERVICES
P.O. BOX 1518
CONCORD, NEW HAMPSHIRE 03301

Colonel Carl B. Sciple
Division Engineer
U.S. Army Corps of Engineers
New England Division
424 Trapelo Road
Waltham, Massachusetts 02254

NCV 16 1982

Dear Colonel Sciple:

This is our Fish and Wildlife Report on the Patchogue River Navigation Project, Westbrook, Connecticut. It has been prepared under authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

The proposed project consists of widening the existing 8-foot deep, 75-foot wide entrance channel to 125 feet from deep water in Duck Island Roads to the confluence of the Menunketesuck and Patchogue Rivers, a distance of about 1,800 feet. Approximately 17,500 cubic yards of sandy material would be excavated from this channel modification project.

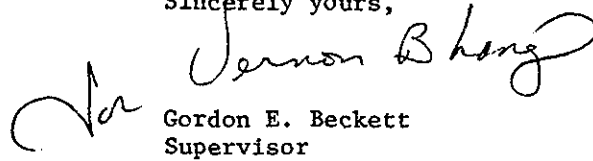
We understand the dredge materials will be deposited above the mean high water elevation on Grove Beach by hydraulic dredging equipment. However, local sponsors are responsible for spreading and grading the mounds of sand after deposition by the Federal contractor.

In our October 8, 1981, letter, we recommended that your office undertake an analysis of the migration potential of this dredge material. We remain concerned about the possibility of this material adversely impacting shellfish habitat in the project area. This issue may be complicated if the project is completed in phases by different parties. Based on our review of the DPR, we could not find evidence of the recommended analysis or indications that it would be performed. Therefore, we recommend that the analysis be performed prior to issuance of the final DPR and further, that specifications be developed to insure that final placement of the dredge material remains above mean high water. Material placed below this elevation by private interests probably would require a Section 10/404 permit, and we are not aware that this was previously contemplated.

We previously recommended time of year restrictions to preclude dredging during the period March 1 - September 30 to avoid conflicts with periods of critical biological activity. The dredging window specified in the DPR could conflict with spring spawning and/or migration activity. Therefore, we recommend that the dredging dates be specified for the months October - February. Some slip-page time may be available on either end depending on climatic conditions and other factors during the year of actual construction.

The issue of future development in the Patchogue and Menunketesuck Rivers has not been properly evaluated in planning documents for this project. This subject should be given a substantive evaluation in the final DPR. We are concerned that this project not promote or facilitate new or additional impacts to saltmarsh, mudflat or other wetland habitat in the area served by this Federal project.

Sincerely yours,

A handwritten signature in cursive script, appearing to read "Gordon E. Beckett".

Gordon E. Beckett
Supervisor



DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

Commander (oan)
Third Coast Guard Distr.
Governors Island
New York, NY 10004
FTS: 664-7170

16518

NOV 22 1982

From: Commander, Third Coast Guard District
To: U.S. Army Corps of Engineers, New England District
Subj: Draft Project Report and Enviromental Assessment of Patchogue River

1. We have no objection to the implementation of this project as proposed. This project should improve navigational safety along the Patchogue River.
2. We request that a minimum of four weeks advance notice be given prior to commencing dredging operations so we can move our buoys to avoid damage by the dredge.


D. A. NAUS
By direction



STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION



December 2, 1982

WATER QUALITY CERTIFICATE

Colonel Carl Sciple
Division Engineer
U.S. Army Corps of Engineers
New England Division
424 Trapelo Road
Waltham, MA 02254


Re: NEDPL-I
Westbrook

Dear Colonel Sciple:

The Department has reviewed the Army Corps of Engineers' proposal to hydraulically dredge the Patchogue River from Long Island Sound to the confluence of the Patchogue and Menunkotesuck Rivers, widening the channel from 75 feet to 125 feet and maintaining the controlling depth at 8 feet, and pump the dredged material to be placed below mean high water at Grove Beach.

In accordance with Section 401 of the Clean Water Act, the Department hereby certifies that the proposed action will not permanently violate Connecticut's Water Quality Standards providing that no underwater excavation is performed during the shellfish spawning period between June 1 and October 1 of any year.

The proposed work is consistent with the applicable policies and goals of Connecticut's Coastal Area Management Program.

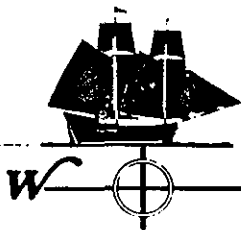

Stanley J. Pac, Commissioner

Dated: December 2, 1982
cc: USACE - Regulatory Branch

Phone:

4-26
State Office Building, Hartford, Connecticut 06115

An Equal Opportunity Employer



TOWN OF WESTBROOK

WESTBROOK, CONNECTICUT 06498

203/399-6236

December 23, 1982

Colonel Carl B. Sciple, Division Engineer
Dept. of Army Corps of Engineers
New England Division
424 Trapelo Road
Waltham, Massachusetts 02254

Dear Colonel Sciple:

Re: NEDPL-C
Patchogue River Widening Project

We have reviewed the Army Corps of Engineers Report on the Widening Project and agree with the findings and recommendations.

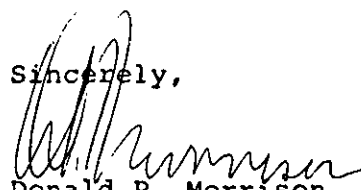
The Board of Selectmen would like you to proceed with the implementation.

On the basis of recent assurances from the Westbrook Marine Businessmen's Association to fund the non federal portion of \$38,000 for the project, I feel reasonably certain that we can meet the items of local cooperation.

Federal	\$96,000
Town	\$50,000
Non Federal	\$38,000

Total Project	\$184,000
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Sincerely,


Donald P. Morrison
First Selectman

DPM:mah